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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF
HARVARD UNIVERSITY.

NEW SERIES. — No. XXII.

BY M. L. FERNALD.

- I. The Northeastern *Carices* of the Section *Hyparrhenae*.
- II. The Variation of some Boreal *Carices*.

WITH FIVE PLATES.

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I.—THE NORTHEASTERN CARICES OF THE SECTION
HYPARRHENAE.

THE Carices of Koch's subgenus *Vigneae*, with its sections *Acroarrhenae* and *Hyparrhenae* of Fries, have always perplexed the systematist, and by the general student they have as a rule been ignored or vaguely referred to such characteristic species as *Carex straminea* or *C. echinata*. Recently, however, the generally widening interest in systematic botany has brought together in *Carex*, as in other groups, a large mass of material; and an attempt to identify these specimens has made it necessary to study in great detail the minuter but tolerably constant characteristics of the fruiting plants.

In general, the classification of Carices has always been based upon characters in the inflorescence; and although the detailed study of the perigynia (or utriculi) has been the final resort of the specialist, an attempt has been made in our manuals to separate species as much as possible upon the more obvious characters of the inflorescence. Thus *Carex scoparia* is described in the two current manuals as having the spikelets (spikes) "all contiguous or bunched" or "usually aggregated;" while in only one of these works is Boott's var. *minor* given recognition, and there as a mere dwarf variety. Yet in plants which are undoubtedly *C. scoparia* the spikelets are often scattered, forming a loose moniliform spike; and the northern plant described by Boott as var. *minor* has a distinct range and unique habitat, while its minute thick-bodied perigynia distinguish it at a glance from the more southern species with which it has been associated.

The case of *Carex scoparia* is only one of many in which the attempt to rely upon superficial characteristics has led us to confuse plants

which are genetically very distinct. Consequently, as stated, an attempt has been made to get at a more satisfactory basis for classification by studying the characteristics of the perigynia, which, naturally, are subject to less variation than is the superficial aspect of the inflorescence as a whole. But since variations in texture and nerving, which are perfectly evident upon comparison of specimens, are extremely difficult to render clear in descriptions, it has been found advisable to employ as the primary basis of division, at least in the groups here discussed, the actual or proportional measurements of the perigynia or the achenes. Even this method of careful measurement may sometimes prove misleading, but in most species the perigynia vary within certain clearly defined limits, and it is only the very exceptional individual which will not fit the system here proposed. And, although in rare cases a species thus presents perplexing forms in which the perigynia are not characteristic, many attempts to classify the members of this group have convinced the writer that by actual measurement alone can we safely identify plants of such strong outward resemblance as *Carex straminea*, *C. scoparia* and *C. tenera*, or *C. alata* and *C. albolutescens*.

As a result of these studies it has been found desirable to treat many plants in a manner somewhat different from that in any current synopses of the genus, and in some cases a study of the original descriptions and specimens has brought the writer to conclusions very different from those generally accepted by American caricologists. Some of these points are of slight significance, others of fundamental importance; and, since it is inadvisable to complicate the synoptic treatment of the species with detailed discussions as to the identity and synonymy of different forms, the more important questions may be here discussed.

Carex scoparia, Schkuhr, presents little difficulty, as the original figure is unmistakable. The species has, however, been made to harbor plants of very different aspect; and a study of the fruiting characters shows these to fall into three groups with marked and constant characteristics. *C. scoparia*, itself, has the perigynium very thin and scale-like, with the wings so strongly developed as to minimize the apparent thickness of the body. This plant in its different forms is of broad range south and west of the Gulf of St. Lawrence.

The other two species which have been included with *Carex scoparia* have the narrower subulate or elongate-lanceolate perigynia so little winged as quite to lack the scale-like character seen in that species. The best known of these two plants is the form described by Francis Boott as *C. scoparia*, var. *minor*. The material from which Boott's

plate was drawn was collected by Tuckerman at the base of the White Mountains; and since it is necessary to distinguish the plant by a new specific name (*minor* having been used too often as a varietal name to be eligible) and since there is already a *Carex Tuckermani*, it is a pleasure to commemorate the explorations and generous services of the Crawford family, familiar to a long generation of visitors to the White Mountains. This plant with which their name now becomes associated is common in northern New England and about the Great Lakes, thence extending far northward.

The other plant with narrow thick perigynia is more puzzling. In the dark brown color of its broad scales it is unlike the other forms which have been referred to *Carex scoparia*. In fact, by different students it has been referred with doubt to *C. tribuloides*, *C. leporina*, and *C. foenea* as well. Yet in its perigynium it resembles only Boott's *C. scoparia*, var. *minor*. This tall dark-spiked plant, which is common in the region of Orono, Maine, has been collected by Professor Lamson-Scribner and by the writer, but it seems to be unknown from other regions. This fact immediately suggests that it may be an introduced form, but a careful search through Old World material and descriptions fails to show anything to which it can be referred. It is, therefore, here treated as a local species, taking the name of the town from which all our material has been collected.

One other form of the *scoparia* group should be specially mentioned since, by an unfortunate misinterpretation, it has already caused needless confusion. This is *Carex scoparia*, var. *moniliformis*, Tuckerman. A specimen in the Gray Herbarium from Tuckerman himself, is without question a slender-spiked form of *C. scoparia*. The variety was so treated by Francis Boott, in whose table 368 it is well represented. Yet in his Preliminary Synopsis of the genus Professor Bailey treated it without question as identical with his own *C. tribuloides*, var. *reducta*; and Professor Britton, following his lead, has since made the new combination, *C. tribuloides*, var. *moniliformis* (Tuckerman) Britton, for a plant very different from that to which the varietal name was originally applied.

Carex tribuloides, Wahl., has been clearly treated by Professor Bailey.¹ *C. Bebbii*, Olney, however, which by him is reduced to a variety of that species, seems to be as well marked as other members of the subgenus, and it is here given equal rank with them. In its shorter, broader, and

¹ Mem. Torr. Cl., I. 54.

thicker perigynia it is more nearly related to *C. straminea* and its allies. So, likewise, *C. cristata*, Schwein., is reinstated as a species, since its tolerably constant habit and its shorter, firmer perigynia place it as near *C. straminea* as to *C. tribuloides*.

The diverse plants which have been treated by various authors, now as distinct species, now as forms of *Carex straminea*, fall into groups which are, in the main, fairly free from complexity. The attempt to separate these forms by color-characters has naturally led to much confusion, for plants which in bright sunlight have a strongly marked ferrugineous tendency, in shade are often quite green. The shape, size, nerving, and texture of the perigynia, however, show that almost without exception the species proposed by Willdenow, Schkuhr, Torrey, Schweinitz, Dewey, and other early students of the group were based on permanent characters. To treat all these well marked and constant forms as varieties of one species is adding confusion rather than clearness to our interpretation of the genus, especially when several of them are as closely related to other well recognized species.

The identity of Willdenow's *Carex straminea* was settled by Professor Bailey¹ in 1889, and a recent examination of Willdenow's material by Dr. J. M. Greenman has verified Professor Bailey's conclusions. *C. albolutescens*, Schweinitz, is now well understood, as are likewise *C. mirabilis*, Dewey, *C. tenera*, Dewey, *C. Bicknellii*, Britton (*C. straminea*, var. *Cravei*, Boott), and *C. alata*, Torrey. But *C. festucea*, Schkuhr, *C. straminea*, var. *brevior*, Dewey, and *C. foenea*, var. β , Boott, seem to have been less clearly understood.

Schkuhr's *Carex festucea*, according to the original description, was a plant with about eight spikelets subapproximate or in a loosely cylindric spike, and the species is so represented in Schkuhr's figure. It is likewise well represented by Dr. Boott, who apparently had a clear conception of the species, in his table 386. Schkuhr's *C. straminea*, which we now know to be different from Willdenow's plant of that name, was an extreme form of *C. festucea* with fewer spikelets, and until recently it passed as the type of the species; i. e., *C. straminea (typica)* of Boott and others. This plant, however, was called by Dewey *C. straminea*, var. *brevior*, and under that name it has been treated by Professor Bailey. He includes with it, though, the *C. festucea* of Schkuhr, a plant which, though closely related, is of rather marked appearance and of more limited range. More recently Dr. Britton, in

¹ Mem. Torr. Cl., I. 21.

restoring to specific rank *C. festucea*, has included in it Dewey's *C. straminea*, var. *brevior*, and in the Illustrated Flora he figures the latter plant under the former name. But the late Dr. Eliot C. Howe, in his admirable treatment of the New York Species of *Carex*, has recognized both plants, thus following the general treatment of Francis Boott and other earlier writers and at the same time clearing the names *festucea* and *brevior* from the confusion which has recently surrounded them.

Carex foenea, var. β of Boott has had a peculiarly unsettled history. When Francis Boott described and figured the plant as a variety of *C. foenea*, the latter name applied to *C. albolutescens*, Schweinitz, not to the true *C. foenea* of Willdenow. It was Boott's opinion, then, that the slender brown-spiked plant of the interior was a phase of what we now know without much doubt to be *C. albolutescens*. In the fifth edition of the Manual Dr. Gray took up *C. foenea*, var. β as *C. foenea*, var. (?) *ferruginea*; and later the plant was distributed by Olney as a variety of Dewey's *C. tenera* (*C. straminea*, var. *aperta*, Boott). In his Preliminary Synopsis in 1886, Professor Bailey reduced it to synonymy under *C. straminea*, Schkuhr (not Willd.), and later in his Critical Studies of Types he treated this plant along with *C. festucea*, Schkuhr, and *C. straminea*, var. *Crawei*, Boott (*C. Bicknellii*, Britton) as identical with *C. straminea*, var. *brevior*, Dewey (*C. straminea*, Schkuhr, not Willd.). Subsequently, however, he has taken out of his *C. straminea*, var. *brevior*, two plants, which he treats as parallel varieties, var. *Crawei*, Boott, and var. *ferruginea* (*C. foenea*, var. β , Boott); and at the same time he has discussed as a species *C. albolutescens*, Schweinitz (*C. foenea* of authors, not Willd.). This course has greatly cleared the group from its former confusion; but it is unfortunate that while separating *C. albolutescens* specifically Professor Bailey should have attached *C. foenea*, var. β to the slender usually flexuous-spiked *C. straminea*, whose identity he had already so carefully worked out. *C. foenea*, var. β in its stiff habit, its strongly appressed broad-ovate perigynia, and the texture of its leaf-sheaths, is quite unlike that species, but is very close to *C. albolutescens* with which it had been placed by Francis Boott. In these characters, likewise, it is equally close to *C. alata*, Torr., while its perigynia and the occasional awn-tips of the scales are so like those of the latter species as to place it nearer to that than to the former plant.

The two species, *Carex foenea*, Willd., and *C. adusta*, Boott, have already been discussed and very clearly settled by Professor Bai-

ley.¹ But his own *C. foenea*, var. *perplexa* has proved very puzzling to students of the group. In the original description of this variety at least two distinct species are referred to, while the words "head erect or nearly so" have proved misleading for a plant with more flexuous spikes (heads) than ordinarily occur in the type of the species.

Dr. J. M. Greenman has kindly compared with Willdenow's original material various plants passing in America as *Carex foenea*, and he has furnished the writer with detailed camera-drawings from Willdenow's material. From these comparisons there seems no doubt that the original *C. foenea* was, as Professor Bailey has already stated, the smallest form of the species, with 4 to 9 spikelets in a suberect linear-cylindric spike. This is the plant subsequently described by Tuckerman as *C. argyrantha* and figured by Boott in his table 382, fig. 2.

Professor Bailey's *Carex foenea*, var. *perplexa* was based on Boott's table 380 and a portion of table 382 (presumably fig. 1), upon Olney's *C. albolutescens* (Exsicc. fasc. 1, no. 8), as well as his *C. albolutescens*, var. *sparsiflora* (fasc. V. no. 11). Now, the perigynia of good *Carex foenea* are strongly and conspicuously nerved on both faces, and the spikelets are pale green or silvery brown. The first part of var. *perplexa* (Boott's table 380) shows a perigynium quite nerveless or only faintly short-nerved on the inner face; the second component (table 382, fig. 1) is the characteristic large form of *C. foenea* with crowded spikes of large spikelets; the third (*C. albolutescens* of Olney) is, as represented by two sheets in the Gray Herbarium, a form between the large state and the small typical *C. foenea*; while the fourth component (*C. albolutescens*, var. *sparsiflora*, Olney — at least the New Brunswick plant) in habit as well as in the nerveless inner face of the perigynium closely matches the first cited plate (Boott's table 380). From the fact that var. *perplexa* was proposed as a variety of *C. foenea* it is probable that its author had in mind the coarse form represented by Boott's table 382, fig. 1, and in the present treatment of the group it has seemed advisable to retain that name for the large plant.

Olney's *Carex albolutescens*, var. *sparsiflora* is represented in the Olney Herbarium by two different plants. One of these, from Oregon, is the dark-spiked form of *C. praticola* which has been described as *C. pratensis*, var. *furva*, Bailey. The other, from Kent Co., New Brunswick, the northeastern plant which is identified with Boott's table 380, is much more closely related to *C. adusta*, Boott, than to *C. foenea*, Willd.

¹ Mem. Torr. Cl., I. 24.

From the former species it differs constantly in its more slender habit and flexuous elongated spikes of clavate-based spikelets, as well as in smaller achenes. It is a plant of broad range from Labrador to British Columbia, creeping south to the coast of New England and the mountains of New England and New York. Since its varietal name, *sparsiflora*, is preoccupied in the genus, another specific name is here proposed in reference to the characteristic color of the mature inflorescence.

The other large group of the *Hyparrhenae* which has been treated by recent authors as the subsection *Elongatae* contains plants of two markedly different tendencies. One group is characterized by strongly divergent thin-edged perigynia which are spongy at base. The other group has ascending plump or plano-convex perigynia which are rarely thin-edged and are without conspicuously spongy bases. Mr. Theodor Holm, who has recently studied some of the members of the first group, includes with them *Carex gynocrates* and *C. exilis*, which by most other authors have been placed in the *Dioicae*. The texture and aspect of the perigynia seem to justify the treatment proposed by Mr. Holm and formerly for *C. exilis* by Francis Boott;¹ and for the group thus constituted Mr. Holm suggests the name *Astrostachyae*.² The other group, with ascending blunt-edged perigynia, may well retain the subsectional name *Elongatae*, since the characteristic species, *C. elongata*, *C. brunne-scens* (*C. Gebhardii*), *C. canescens* (*C. curta*), etc., were originally included in it by Kunth.

Mr. Holm, in the paper cited, takes exception³ to Professor Bailey's recent treatment⁴ of *Carex echinata*, *C. sterilis*, and *C. scirpoides*, on the ground that that author had been more controlled by the original specimens of Willdenow and of Schkuhr than by the original diagnoses. That Willdenow's original descriptions do not accord well with Professor Bailey's conclusions there can be no doubt; and when we are told by Professor Bailey that *C. sterilis* and *C. scirpoides* are identical, and when he says "the figures of both *C. sterilis* (fig. 146) and *C. scirpoides* (fig. 180) in Schkuhr's 'Riedgräser' are unequivocal,"⁵ we find it indeed difficult to understand his observations. An examination of Schkuhr's figures shows his *C. sterilis* (fig. 146) to be a coarse plant with sharp-pointed ovate scales and broad-ovate cordate perigynia with distinct beak shorter than the body. Schkuhr's *C. scirpoides* (fig. 180), on the other hand, is represented with broad-oblong or elliptical blunt

¹ Boott, Ill., I. 17.

³ Holm, l. c., 212.

⁵ Bailey, l. c., 424.

² Holm, Theo., Am. Jour. Sci., Ser. 4, XI. 205-223.

⁴ Bailey, Bull. Torr. Cl., XX. 422.

scales and deltoid-ovate obscurely short-beaked perigynia. These figures of Schkuhr's agree very well with his descriptions. Furthermore, they agree equally well with Willdenow's diagnoses, for these latter were essentially the same as Schkuhr's. Professor Bailey further states that *C. sterilis* and *C. scirpoides* are identical with the common American plant which he had formerly treated as *C. echinata*, var. *microstachys*, a plant with lanceolate or narrowly ovate slender-beaked perigynia; and for this aggregate he takes up the name *C. sterilis*. After thus bunching three very different species as *C. sterilis*, he separates from "our so-called *Carex echinata*" two plants, *C. atlantica* and *C. interior*, with "ample specific characters."

Through the kindness of Dr. J. M. Greenman the writer has been able to examine camera-drawings of Willdenow's original material; while from Professor Carl Mez he has received fragments from the original material of Schkuhr. The drawings of the Willdenow material of both *Carex sterilis* and *C. scirpoides*, and the Schkuhr specimens of *C. scirpoides* agree with the original diagnoses. Dr. Greenman has, further, compared critically specimens sent him of the different American forms with Willdenow's plants and with authentic specimens of *C. stellulata*, Gooden. (*C. echinata*, Murray). The identification thus made of these forms, leads to a conclusion very different from that published by Professor Bailey. These results may best be stated by discussing separately the three clearly cut species which have been so unfortunately confused.

Carex echinata, Murray (*C. stellulata*, Gooden.). This species was long considered a boreal plant of broad range, and it was so treated by Torrey, Tuckerman, Dewey, Carey, and other early students of American *Carices*. Francis Boott distinctly implied that the European species occurs in British America, saying: "I have not seen specimens which I can satisfactorily refer to the European *C. stellulata*, south of the British provinces of North America."¹ Yet Professor Bailey has interpreted this to mean that "Francis Boott questioned if the American plant is the same as the European *C. stellulata* (or *C. echinata*);" and in "eliminating the European species from our flora," he says: "Definite specific characters of separation are obscure, and yet I am convinced that they exist. The American plant is habitually taller than the European, the scales are sharper and usually longer, the perigynia are more strongly nerved and more attenuated or conical,

¹ Boott, Ill., I. 56.

and above all, it is far more variable. . . . There are probably no species common to both countries, except those which are hyperboreal and occur through the Arctic regions of both hemispheres, being found in Greenland."¹

Then Professor Bailey defines his conception of the "habitually taller" American plant with "sharper" scales, etc., etc., including in it forms varying from the low slender *Carex stellulata*, var. *angustata*, Carey, with "narrowly-lanceolate perigynia tapering into a long . . . beak,"² to the tall (often nearly 1 m. high) coarse *C. sterilis*, Willd., with broad-ovate perigynia, and the slender *C. scirpoides*, Schkuhr, with thick scarcely beaked often nerveless deltoid-ovate perigynia and elliptic blunt scales. The two latter constituents of this aggregate apparently do not occur outside North America and if they are included with the other American representative of *C. echinata* as one species, it is of course easily said that the American plant is taller or shorter, coarser or more slender than the European; and certainly a species so constituted is "far more variable."

When, however, we eliminate from the complex *Carex sterilis* of Professor Bailey's treatment the true *C. sterilis* and *C. scirpoides*, there is left a plant characterized by slender culms and leaves, the perigynia barely half as broad as long, and tapering to a slender conspicuous beak which is often nearly as long as the body. This is the *C. echinata* or *C. stellulata* of American authors and it includes as formal variations the very slender var. *angustata*, Carey (*C. echinata*, var. *microstachys*, Boeckeler), and the tall *C. sterilis*, var. *excelsior*, Bailey, while a very coarse variation with rather better defined characteristics is *C. echinata*, var. *cephalantha*, Bailey.

This American species with the narrow perigynia has been compared many times by the writer with European *C. echinata* in a vain attempt to find some point of distinction. Specimens collected by Godet at Lignières on the River Cher in central France are inseparable from Mertens' material from Sitka, and, again, Japanese specimens collected by Chas. Wright and by Maries are identical in their slender perigynia with Newfoundland plants. In order, however, to test still further the specific value of the American plant a portion of Allen's Labrador material was forwarded to Dr. Greenman at Berlin, and he was asked to compare it, along with other American forms, with Willdenow's types

¹ Bailey, Bull. Torr. Cl., XX. 423.

² Carey in Gray, Man. 544.

and with other authentic European specimens of the group. In reply Dr. Greenman writes of this specimen:

"No. 4. Differs from the original *C. sterilis*, Willd., in the following characters: (a) narrower, more gradually acuminate and longer beaked perigynium; (b) more oblong achene, which is less narrowed at the base. To me, however, your No. 4 is a *perfect* match for *Carex stellulata* in herb. Willdenow, and for European *C. echinata*, Murr. I am quite unable to make any distinction between them. The perigynial characters are exactly the same."

Extreme difficulty is experienced, then, in attempting to distinguish the American *Carex echinata* from Old World material. The range of the American plant, too, from Labrador to Alaska, and southward in the mountains, immediately places the species in the hyperboreal flora from which Professor Bailey, at least by inference, would exclude it. In view of these two facts there seems, then, as Mr. Holm has already indicated, good reason to consider both the American and the European plant *C. echinata*, Murr.

Carex sterilis, Willd. This plant has already been sufficiently defined in the discussion of Willdenow's original description and of Schkuhr's figure. The writer has, however, examined with much care camera-drawings of Willdenow's material made by Dr. Greenman and fragments of Schkuhr's material generously sent by Professor Carl Mez. The Willdenow plant, which alone is of final importance, proves to be identical with the large species of the Atlantic seaboard recently described as *C. atlantica*. The fragment sent by Professor Mez from the Schkuhr herbarium is, however, from cultivated material, and is only a form of *C. echinata* with narrow perigynia quite unlike those shown in Schkuhr's figure and in the Willdenow plant as further shown by Dr. Greenman's report of his critical comparisons in the Willdenow herbarium.

Besides No. 4, the Labrador *Carex echinata*, two other forms were sent to Dr. Greenman for comparison with *C. sterilis*. No. 1 is *C. echinata*, var. *cephalantha*, Bailey, collected by Dr. C. B. Graves at Waterford, Connecticut, May 27, 1896. No. 2 is characteristic *C. atlantica*, Bailey, collected by Dr. G. G. Kennedy at Ponkapog, Canton, Massachusetts, July 12, 1899. Of these two plants Dr. Greenman writes:

"No. 1. This differs from *C. sterilis*, Willd., in the following characters: (a) longer inflorescence, more remote and slightly longer spikelets; (b) longer and more prominently beaked perigynium; (c) achene less narrowed at the base.

"No. 2. I am quite unable to distinguish this plant from the original of *C. sterilis*, Willd. It has the same broad-ovate, short-acuminate or short-beaked perigynium, and the same achenial characters, that is, the achene is rather conspicuously narrowed below. The characters of the inflorescence are the same, except as to color. The Willdenow plant is more brownish: this, however, may be due, at least to a certain extent, to age."

From Willdenow's original description, from Schkuhr's description and figure, and from Dr. Greenman's examination and drawings of the Willdenow plant, there seems no question, then, that *Carex atlantica*, Bailey, is the true *C. sterilis*, Willd.

Carex scirpoides, Schkuhr. The characters of this species, likewise, are sufficiently stated in the discussion of Schkuhr's and Willdenow's characterizations. Material from the Schkuhr herbarium received through Professor Mez is identical with camera-drawings made by Dr. Greenman from Willdenow's plant. These accurately agree, also, with Schkuhr's fig. 180. This species, was, furthermore, correctly interpreted by Sartwell, Carey, and Boott, and it is well represented as *C. stellulata*, var. *scirpoides* in Boott's Illustrations, t. 146.** Sartwell's No. 36 and Boott's plate are the only exact citations given by Professor Bailey for his *C. interior*, and his description of the so-called new species accords well with those of Willdenow and of Schkuhr. In distinguishing *C. interior* from *C. scirpoides*, Bailey says that the former has "greenish-tawny spikes," while the latter is "fulvous;" and he furthermore describes Schkuhr's *C. scirpoides*, "as the plate plainly shows," with "long-beaked broad-winged perigynia." How such a statement and such conclusions could have been made is very puzzling. There can be no question, however, that the figure of Schkuhr's *C. scirpoides* as interpreted by Dewey, Schweinitz, Torrey, Sartwell, Carey, Francis Boott, Holm, and other students of the genus, is the same as Boott's table 146 ** upon which, in part, *C. interior* was founded.

The name *Carex scirpoides*, Schkuhr, so long attached to this plant, was published in 1805, but it cannot, unfortunately, be retained for the species, since in 1803 Michaux published *C. scirpoidea*, the well known dioecious plant of extreme boreal and alpine regions. The next clearly defined name for the plant seems to be *C. interior*, although, as originally intended by its author, that name was supposed to apply to a species very distinct from *C. scirpoides*. Tuckerman, it is true, published in his Enumeratio Methodica the name *C. stellulata*, var. *scirpina*, citing *C. scirpoides*, Schkuhr, as a synonym. On a preceding page, however,

in an unfortunate endeavor to latinize one of Michaux's names, he had substituted *C. scirpina* for *C. scirpoidea*, Michx., not *C. scirpoides*, Schkuhr. This unfortunate citation of "*C. scirpina*" as a pure synonym of Michaux's *C. scirpoidea* attaches to that name a decided element of indefiniteness. It is, therefore, wiser to take for the plant of Schkuhr and of Willdenow the more clearly defined name, *C. interior*.

One other plant of the *Astrostachyae* has been the source of much confusion in the treatment of New England species of this group. Unlike *Carex echinata*, *C. sterilis*, and *C. interior*, the perigynia of this plant are broadest at the middle, thence tapering to a narrow base. In aspect the plant is strikingly like the largest form of *C. canescens*, but its thin-edged strongly recurved perigynia place it clearly in the *Astrostachyae*. The species is not uncommon from eastern Massachusetts to Delaware and central New York, and in New England herbaria it has recently passed variously as *C. atlantica*, *C. interior*, *C. canescens*, var. *vulgaris*, *C. sterilis*, var. *excelsior*, &c. From notes left by the late William Boott it is apparent that he recognized in some of Chas. Wright's Connecticut material an undescribed form, but evidently he never described the plant. A portion of the original material of the late Dr. Eliot C. Howe's *Carex seorsa*, generously furnished the writer by Professor C. H. Peck, agrees in every regard with the perplexing New England plant, and under that name the species should now be known.

The members of the *Elongatae*, as here interpreted, offer less difficulties than the other species of the *Hyparrhenae*, and special discussion is needed only of the forms which have been at various times associated with *Carex canescens*. These plants present two marked forms in their perigynia: in one plant, *C. arcta*, the perigynium is broadest at the rounded or subcordate base; while in *C. canescens* and *C. brunnescens* (*C. vitilis*, Fries) the perigynium is nearly elliptic in outline, being broadest near the middle.

Carex arcta of Francis Boott was originally published by him as *C. canescens*, var. *polystachya*, but in his latest treatment of the plant he considered it a distinct species. As stated, its perigynial character is very constant. Furthermore, its rather limited strictly American range and unique habit quickly separate it from most forms of *C. canescens*. *C. canescens*, var. *oregana*, Bailey, said to differ from var. *polystachya* in having the "head larger and more dense . . . becoming brownish," has identical perigynia with that plant, and the spikes (heads) are green or brownish, as are those of the eastern plant, a character dependent on age and exposure to light.

Carex canescens, L., is characterized by its glaucous color and strongly appressed-ascending elliptic pointed perigynia tapering very gradually to the short beak. Another plant, *C. brunnescens*, Poir. (*C. canescens*, var. *alpicola*, Wahl., *C. canescens*, var. *vulgaris*, Bailey), is usually bright green, and the few loosely spreading-ascending perigynia are rather abruptly contracted to a definite serrulate-based beak. This plant is common in dry soils throughout the boreal sections of America and Europe; while the glaucous *C. canescens* is a species of very wet situations. Under various names, *C. vitilis*, Fries, *C. Gebhardii*, Hoppe, etc., *C. brunnescens* has been treated as a species, and as often again as a variety of *C. canescens*. An examination of much material shows its characters to be essentially constant, and, though the plant superficially resembles small forms of *C. canescens*, its claim to specific rank rests upon a number of definite characters.

When *Carex arcta* and *C. brunnescens* are removed from *C. canescens*, there remains a species characterized by its glaucous foliage and appressed scarcely beaked perigynia. This species presents in America three noteworthy variations. The true *C. canescens*, L., of northern Europe has the spikes 2.5 to 5 cm. long, of 4 to 7 oblong-cylindric to narrowly obovoid spikelets 0.6 to 1 cm. long. This plant occurs in Arctic America coming south to northern New England and New York, the Rocky Mts., and Vancouver. Rare in the eastern United States and Canada, the typical form of *C. canescens* has been misinterpreted by recent American students, although the species was very clearly discussed by Francis Boott. The American plant which has passed as true *C. canescens* is, however, strikingly different in aspect, and consequently the typical plant has more than once been published as a local American variety — var. *dubia*, Bailey, and var. *robustina*, Macoun.

Another form of *Carex canescens* common to northern Europe and America is var. *sublohiacea*, Laestadius. In this plant the spike is usually rather shorter than in typical *C. canescens*, the less approximate globose or short-oblong few-flowered spikelets are only 4 to 7 mm. long, and the smaller perigynium is nearly or quite smooth. In its smooth perigynium this plant approaches *C. heleonastes*, which, however, has larger spikelets and perigynia and quite lacks the distinctive glaucous aspect of *C. canescens*. The var. *sublohiacea*, which is commoner in northern New England than is the true *C. canescens*, also simulates *C. brunnescens*; but it is very canescent and the perigynia otherwise as in true *C. canescens* are essentially smooth, while in the greener *C.*

brunnescens they are distinctly beaked, of more membranous texture, and usually with serrate margins.

The commonest form of *Carex canescens* in North America is the plant mentioned without name by Francis Boott and figured by him in his Illustrations, IV. table 496. This unique American form, which in essential characters is like true *C. canescens*, differs in its elongated inflorescence, 5 to 15 dm. long, at least the lower spikelets very remote. The plant seems to have been generally treated by American authors as typical *C. canescens*, and no published name is available for it.

The following synopsis presents the characters and ranges of the northeastern *Hyparrhenae* as now understood by the writer. In its preparation he has studied the material in the Gray Herbarium and the herbarium of the New England Botanical Club; as well as the hundreds of sheets in the herbarium of the Geological Survey Department of Canada, kindly placed at his disposal by Mr. James M. Macoun; those of the Olney Herbarium of Brown University, made accessible to him by Mr. J. Franklin Collins; and a series from the Fairbanks Museum at St. Johnsbury, Vermont, rich in forms of the *scoparia* group, specially accumulated by the director, Dr. T. E. Hazen, for detailed study, and then generously forwarded to the writer. He has also been greatly assisted by the use of material from the private herbaria of the Honorable J. R. Churchill; President Ezra Brainerd; Doctors C. B. Graves, J. V. Haberer, G. G. Kennedy, and C. W. Swan; and Messrs. Luman Andrews, C. H. Bissell, Walter Deane, E. L. Rand, W. P. Rich, and E. F. Williams. The identification of dubious species of Willdenow and of Schkuhr has been facilitated by the coöperation of Dr. J. M. Greenman while at the Royal Botanical Museum in Berlin, and by Prof. Carl Mez of the University of Halle; and authentic material of the late Dr. E. C. Howe's *Carex seorsa* has been generously furnished by Prof. C. H. Peck.

HYPARRHENAE, Fries. Staminate flowers scattered or at the base of the uniform spikelets (only in exceptional individuals and in the often dioecious *C. gynocrates* and *C. exilis* the entire spikelet staminate).

KEY TO SPECIES.¹

* Perigynia with thin or winged margins.

← Perigynia ascending, the tips only sometimes wide-spreading or recurved, not spongy at base, the margins winged at least toward the beak.

¹ The perigynial characters are here based on study of mature plants. In general the perigynia at the tip of the spikelet are less characteristic than those nearer the middle; and, if possible, the latter alone should be used in critical comparisons.

- ↔ Bracts wanting or setaceous, if broad at most twice as long as the spike.
- = Plant strongly stoloniferous; culms rising from an elongated root-stock: perigynium firm, 5 to 6 mm. long (4) *C. siccata*.
- = = Plant not strongly stoloniferous; culms solitary or in stools.
- a. Perigynia less than 2 mm. broad.
- 1. Perigynia 5 mm. or more long.
 - Perigynia 7 to 10 mm. long: spikelets oblong-cylindric, pointed, 1.5 to 2.5 cm. long (1) *C. muskingumensis*.
 - Perigynia shorter (or, when exceptionally 7 mm. long, in shorter spikelets).
 - + Perigynia half as broad as long, plump, nerveless or obscurely short-nerved on the inner face (21) *C. aenea*.
 - + + Perigynia one-third as broad as long.
 - × Perigynia thin and scale-like, scarcely distended over the achenes, distinctly nerved on the inner face, and prominently exceeding the subtending scales.
 - § Leaves at most 3 mm. wide: spikelets 3 to 9, glossy brown or straw-colored, pointed.
 - Spike oblong-ovoid or subcylindric, with ascending approximate spikelets (2) *C. scoparia*.
 - Spike moniliform (2) *C. scoparia*, var. *moniliformis*.
 - Spike short-globose or broad-ovoid, the spikelets crowded and divergent .
 - (2) *C. scoparia*, var. *condensa*.
 - § § Leaves more than 3 mm. wide: spikelets 8 to 14, green or dull brown, blunt (3) *C. tribuloides*.
 - (For vars. see below.)
 - × × Perigynia firm, obviously distended over the achenes, nerveless or obscurely nerved on the inner faces, equalled by the subtending scales (7) *C. praticola*.
- 2. Perigynia less than 5 mm. long.
 - Perigynia thin and scale-like, scarcely distended over the achenes: leaves 3 to 8 mm. broad.
 - + Perigynia with appressed tips.
 - Spike oblong, the spikelets approximate (3) *C. tribuloides*.
 - Spike moniliform, the spikelets scattered
 - * (3) *C. tribuloides*, var. *turbata*.
 - + + Perigynia with spreading tips: spike flexuous
 - (3) *C. tribuloides*, var. *reducta*.
 - Perigynia firm, obviously distended over the achenes.
 - + Perigynia elongate-lanceolate or subulate, less than one-third as broad as long, at most 1.4 mm. broad.
 - × Tips of perigynia conspicuously exceeding the lance-subulate dull scales.
 - Culms 1 to 4 dm. high: leaves 1 to 2.5 mm. wide: spikelets 3 to 7 mm. long (5) *C. Crawfordii*.

Culms taller: leaves broader: spikelets 8 to 11 mm. long

(5) *C. Crawfordii*, var. *vigens*.

× × Tips of perigynia equalled by the ovate bluntish glossy dark scales (6) *C. oronensis*.

+ + Perigynia broader, nearly or quite half as broad as long.

× Tips of perigynia distinctly exceeding the subtending scales.

§ Leaves 2.5 mm. or more wide.

☐ Spikelets compactly flowered, the mature perigynia with recurved or spreading tips concealing the scales (8) *C. cristata*.

☐ Spikelets with ascending or slightly spreading perigynia; scales apparent.

△ Mature perigynia greenish or pale straw-colored, in loose spikelets: spikes more than 2.2 cm. long (if shorter, with dark chestnut scales).

Spikelets approximate in ovoid or oblong spikes.

Scales pale, not strongly contrasting with the perigynia (10) *C. mirabilis*.

Scales dark chestnut, strongly contrasting with the perigynia . . . (10) *C. mirabilis*, var. *tincta*.

Spikelets scattered in a moniliform spike

(10) *C. mirabilis*, var. *perlonga*.

△ △ Mature perigynia brown, in dense spikelets: spikes at most 2.2 cm. long: scales pale brown

(17) *C. Bebbii*.

§ § Leaves narrower.

Spike stiff, with crowded closely flowered spikelets

(17) *C. Bebbii*.

Spike flexuous and moniliform, or at least with the

loosely flowered spikelets scattered . . . (11) *C. straminea*.

× × Tips of perigynia equalled by the subtending scales.

§ Spike stiff and erect, or at least with the spikelets approximate.

Spike brown or ferrugineous (19) *C. leporina*.

Spike brownish white (20) *C. xerantica*.

§ § Spike flexuous, or at least with the lower spikelets remote.

☐ Perigynia nerveless or minutely short-nerved on the inner face.

Mature perigynia straw-colored or pale brown, one-third as broad as long (7) *C. praticola*.

Mature perigynia olive-green or bronze, one-half as broad as long (21) *C. aenea*.

☐ Perigynia with strong ribs the length of the inner face: spike silvery green (18) *C. foenea*.

b. Perigynia 2 mm. or more broad.

1. Tips of the perigynia distinctly exceeding the subtending scales.

- Perigynia thin and scale-like, barely distended over the achenes, one-fourth to one-third as broad as long.
 - Perigynia 7 to 10 mm. long (1) *C. muskingumensis*.
 - Perigynia shorter (2) *C. scoparia*.
 - (For vars. see above.)
- Perigynia firmer, obviously distended over the achenes, nearly or quite half as broad as long.
 - + Perigynia lance-ovate, about half as broad as long.
 - × Leaves 2.5 mm. broad, or broader (10) *C. mirabilis*.
 - (For vars. see above.)
 - × × Leaves narrower.
 - § Perigynia distinctly about 10-nerved on the inner faces, 4 to 6 mm. long.
 - Spikelets 8 to 12 mm. long: perigynia 4.8 to 6 mm. long (12) *C. tenera*.
 - Spikelets 5 to 8 mm. long: perigynia 4 to 5 mm. long (12) *C. tenera*, var. *invisa*.
 - § § Perigynia 3- to 5-nerved on the inner faces, mostly less than 4 mm. long.
 - Perigynia with ascending inconspicuous tips (11) *C. straminea*.
 - Perigynia with divergent conspicuous tips (11) *C. straminea*, var. *echinodes*.
 - + + Perigynia with broad-ovate to orbicular bodies.
 - × Spike moniliform and flexuous, with mostly clavate-based spikelets.
 - Spikelets brownish-white; of close-appressed obscurely beaked firm perigynia (14) *C. silicea*.
 - Spikelets ferrugineous; the abrupt slender beaks of the perigynia with conspicuous loosely ascending or spreading tips (12) *C. tenera*, var. *Richii*.
 - × × Spike stiff (or, if flexuous, with brown or ferrugineous spikelets).
 - § Perigynia 5.6 to 7.7 mm. long, very thin, scale-like, almost transparent: scales blunt (13) *C. Bicknellii*.
 - § § Perigynia less than 5.6 mm. long, firm and opaque (when exceptionally longer in *C. alata*, with aristate scales).
 - Scales long-acuminate or aristate: perigynia 4 to 5.5 mm. long: achenes oblong.
 - △ Spike green, or finally dull brown: scales lance-subulate: perigynia obovate, 2.8 to 3.7 mm. broad, abruptly narrowed at base (15) *C. alata*.
 - △ △ Spike dark brown or ferrugineous: perigynia 2.3 to 2.8 mm. broad.
 - Spikelets closely approximate: scales ovate-lanceolate: perigynia ovate, tapering gradually to the beak (15) *C. alata*, var. *ferruginea*.

Spikelets scattered in a flexuous spike: scales lanceolate: perigynia orbicular, abruptly slender-beaked (12) *C. tenera*, var. *Richii*.

□ □ Scales blunt or at most acutish.

Spikelets gray-green or finally dull brown, with strongly appressed-ascending very firm perigynia 3.5 to 4 (very rarely 4.5) mm. long

(9) *C. albolutescens*.

Spikelets straw-colored or ferrugineous, with spreading-ascending perigynia 4 to 5.5 mm. long.

Spike of 5 to 10 mostly distinct spikelets

(16) *C. festuacea*.

Spike of 3 to 6 approximate spikelets

(16) *C. festuacea*, var. *brevior*.

2. Tips of perigynia equalled by the subtending scales.

○ Spike stiff and erect, or at least with approximate spikelets.

+ Spike whitish or gray-green.

× Perigynia lance-ovate, 4 to 4.8 mm. long, nerveless on the inner faces, golden-yellow at base . . . (20) *C. xerantica*.

× × Perigynia broad-ovate to suborbicular.

Perigynia strongly ribbed the length of the inner faces, 2 mm. broad (18) *C. foenea*.

Perigynia nerveless or faintly nerved on the inner faces, broader (9) *C. albolutescens*.

++ Spike bronze or ferrugineous.

Perigynia distinctly concave on the usually nerved inner faces: achene 1 mm. broad (19) *C. leporina*.

Perigynia flat or convex on the usually nerveless inner faces, very plump: achene 2 mm. broad . . . (22) *C. adusta*.

○ ○ Spike flexuous, at least the lowest spikelets remote.

+ Perigynia nerveless or only faintly short-nerved on the inner faces.

Perigynia ovate-lanceolate, one-third as broad as long: achene 1 mm. broad (7) *C. praticola*.

Perigynia ovate, half as broad as long: achene 1.5 mm. broad (21) *C. aenea*.

++ Perigynia distinctly nerved on the inner faces.

× Perigynia 2.8 to 4.4 mm. long, at most 2.4 mm. broad, 7- to 13-ribbed on the inner faces, abruptly beaked.

Spike of 4 to 9 spikelets 6 to 10 mm. long: perigynia 2.8 to 4 mm. long (18) *C. foenea*.

Spike of 6 to 15 spikelets 10 to 17 mm. long: perigynia 3.5 to 4.4 mm. long . . . (18) *C. foenea*, var. *perplexa*.

× × Perigynia 4 to 5.3 mm. long, 2.5 to 3 mm. broad, 3- to 5-nerved on the inner faces, obscurely broad-beaked

(14) *C. silicea*.

++ Bracts leaf-like and much prolonged, the lowest 1 to 2 dm. long:

spikelets crowded: perigynia subulate (23) *C. synchocephala*.

- ← ← Perigynia horizontally spreading or reflexed when mature, spongy at base, with thin but scarcely winged margins.
- ↔ Spikelets solitary and terminal, pistillate or staminate, or with the flowers variously scattered.
- Stoloniferous; the filiform culms at most 3 dm. high, from filiform rootstocks (24) *C. gynocrates*.
- Not stoloniferous; the wiry culms 2 to 7 dm. high, in caespitose stools (25) *C. exilis*.
- ↔ ↔ Spikelets 2 to several.
- = Perigynia broadest at base: beak rough or serrulate.
- a. Perigynia at most half as broad as long, finally yellowish; with slender beak nearly equalling the body: scales pointed.
1. Perigynia ovate, 3 or 4 mm. long.
- Spikelets at most 12-flowered.
- Spike 1 to 3 cm. long, the 2 to 6 spikelets subapproximate (26) *C. echinata*.
- Spike 2 to 6 cm. long, the 2 to 4 spikelets very remote, the terminal with a clavate base 0.5 to 1 cm. long (26) *C. echinata*, var. *ormantha*.
- ○ Spikelets with more flowers.
- Leaves 1 to 2.5 mm. broad: spikelets scattered, 12- to 20-flowered: perigynia less than half as broad as long (26) *C. echinata*, var. *excelsior*.
- Leaves 2 to 4 mm. broad: spikelets mostly approximate, 15- to 40-flowered; perigynia half as broad as long (26) *C. echinata*, var. *cephalantha*.
2. Perigynia lanceolate or ovate-lanceolate, 2.5 to 3 mm. long: spike of 2 to 6 approximate spikelets (26) *C. echinata*, var. *angustata*.
- b. Perigynia more than half as broad as long, firm, brownish or dark green, the beak one-fourth to one-half as long as the body.
1. Scales sharp-pointed: leaves 2.5 to 4.5 mm. broad: spike 1.5 to 3.5 cm. long; spikelets 15- to 50-flowered: coarse plant (27) *C. sterilis*.
2. Scales blunt: leaves narrower: spike 1 to 2 cm. long; spikelets 5- to 15-flowered: slender plants.
- Leaves 1 to 2 mm. broad: perigynia faintly nerved or nerveless on the inner faces (28) *C. interior*.
- Leaves narrower: perigynia strongly nerved (28) *C. interior*, var. *capillacea*.
- = = Perigynia broadest near the middle, less than 2 mm. broad, very thin and conspicuously nerved, with short smooth beak: spikelets remote (29) *C. seorsa*.
- ** Perigynia not thin-winged, ascending from the first, plano-convex.
- + Perigynia 4 mm. or more long, long-beaked.
- Spikelets lanceolate, in a loosely linear-cylindric spike: perigynia 1 to 1.3 mm. broad, strongly nerved: scales oblong: leaves 1 to 2.5 mm. broad (33) *C. bromoides*.
- Spikelets ovate, in flexuous spikes, the lowest very remote: perigynia 1.6 to 1.9 mm. broad, faintly nerved or nerveless: scales ovate: leaves 2 to 5 mm. broad (34) *C. Deweyana*.

← ← Perigynia less than 4 mm. long.

↔ Perigynia 2 mm. or more long.

= Perigynia with serrulate beaks or margins.

a. Spike elongate, from linear-cylindric to oblong.

1. Perigynia ovate, broadest at base: spikelets mostly or all approximate in an oblong-cylindric spike . . . (30) *C. arcta*.

2. Perigynia broadest near the middle.

○ Plant glaucous: leaves 2 to 4 mm. broad: spikelets with many appressed-ascending glaucous obscurely beaked perigynia. Spikelets 6 to 10 mm. long, approximate, or the lowest rarely 1.5 cm. apart: perigynia 2.3 to 3 mm. long

(31) *C. canescens*.

Spikelets 4 to 7 mm. long, subapproximate or remote: perigynia about 2 mm. long (31) *C. canescens*, var. *sublobiacea*.

Spikelets 6 to 12 mm. long, remote, the lowest 2 to 4 cm. apart . . . (31) *C. canescens*, var. *disjuncta*.

○○ Plant green, not glaucous: leaves 1 to 2.5 mm. broad: spikelets with few loosely spreading dark green or brown distinctly beaked perigynia . . . (32) *C. brunnescens*.

b. Spike subglobose, of 2 to 4 closely approximate subglobose loosely flowered silvery spikelets: perigynia oblong, beakless, nerved, 3 to 3.4 mm. long . . . (35) *C. tenuiflora*.

= = Perigynia smooth throughout.

a. Spike whitish, silvery-green or pale brown, not ferrugineous nor dark brown.

1. Spike elongate, at least the lower spikelets scattered.

Uppermost spikelet divaricate-pedunculate, the lowermost subtended by a long leaf-like bract: perigynia more than 3 mm. long . . . (36) *C. trisperma*.

Spikelets continuous in a linear-cylindric loose spike, bractless or only short-bracted: perigynia 2 to 3 mm. long

(31) *C. canescens*.

(For vars. see above.)

2. Spike subglobose, of 2 to 4 closely approximate subglobose loosely flowered spikelets: perigynia beakless, 3 mm. or more long . . . (35) *C. tenuiflora*.

b. Spike ferrugineous or dark brown.

1. Terminal spikelet with conspicuous clavate base: perigynia abruptly beaked: culms smooth (or harsh only at tips).

○ Spikelets distinct; the lowest 4 or 5 mm. thick; the terminal 1 to 1.8 cm. long: perigynia pale, about equalled by the yellowish-brown blunt scales . . . (38) *C. norvegica*.

○○ Spikelets approximate; the lowest less than 4 mm. thick.

Plant weak and lax: leaves involute, 0.5 to 1.5 mm. broad: perigynia pale, equalled by the ferrugineous acutish scales

(39) *C. glareosa*.

Plant stiff and upright: leaves flat, 1 to 3 mm. broad: perigynia brown or reddish, exceeding the fuscous obtuse scales . . . (40) *C. lagopina*.

2. Terminal spikelet without conspicuous clavate base: perigynia obscurely beaked, brown-tinged, exceeding the blunt scales: culms sharply angled, harsh and stiff: leaves flat, erect

(41) *C. heleonastes*.

- ↔ ↔ Perigynia at most 1.5 mm. long, oblong-cylindric, plump, nerveless, beakless or with a very short broad truncate beak: culms wiry: spike linear-cylindric, dull brown (37) *C. elachycarpa*.

SYNOPSIS OF SPECIES.

Ovales, Kunth. *Perigynia ascending* or slightly spreading (when horizontally spreading, always with winged margins), *with thin or winged margins*, mostly *with concave inner faces* when mature.

§ OVALES proper. Bracts, when present, setaceous, or, if broader, only once to twice longer than the spike.

* Mature perigynia one-fourth to one-third (.24 to .36) as broad as long.

+ Perigynia extremely thin and scale-like, barely distended over the achenes.

↔ Perigynia 7 to 10 (average 8.3) mm. long.

1. *C. MUSKINGUMENSIS*, Schweinitz. — Figs. 1, 2. — Culms 1 m. or less tall, very leafy: the loose flat *leaves subcordate* at their junction with the loose green sheaths; those of the sterile shoots crowded and almost distichous: spike oblong, of 5 to 12 appressed-ascending *oblong-cylindric pointed spikelets 1.5 to 2.5 cm. long*. — Ann. Lyc. N. Y. i. 66; Dewey, Am. Jour. Sci. x. 281; Bailey in Gray, Man. ed. 6, 620; Britton in Britton & Brown, Ill. Fl. i. 355, fig. 861. *C. arida*, Schwein. and Torr. Ann. Lyc. N. Y. i. 312, t. xxiv. fig. 2; Carey in Gray, Man. 545; Boott, Ill. i. 20, t. 54; Boeckeler, Linnaea, xxxix. 112; Bailey, Proc. Am. Acad. xxii. 147; Macoun, Cat. Can. Pl. ii. 129. *C. scoparia*, Torr. Ann. Lyc. N. Y. iii. 394, in part, not Schkuhr. *C. scoparia*, var. *muskingumensis*, Tuck. Enum. Meth. 8, 17. — Meadows, swamps, and wet woods, OHIO to MANITOBA and MISSOURI. July, August.

↔ ↔ Perigynia at most 6.5 (very rarely 7) mm. long.

= Perigynia 5 to 6.5 (average 5.7) mm. long.

2. *C. SCOPARIA*, Schkuhr. — Figs. 3, 4. — Culms 0.2 to 1 m. high, mostly slender and erect: *leaves narrow (at most 3 mm. wide)*, shorter than the culm: *spike oblong-ovoid to subcylindric, of 3 to 9 straw-colored or brownish mostly shining and ascending ovoid pointed spikelets 0.5 to 1.5 cm. long*. — Schkuhr in Willd. Sp. iv. 230, & Riedgr.

Nachtr. 20, t. Xxx. fig. 175; Dewey, l. c. viii. 94; Schwein. & Torr. l. c. 313; Torr. l. c.; Carey, l. c.; Boott, l. c. iii. 116, t. 368, in part; Bailey, l. c. 148, & in Gray, l. c.; Macoun, l. c. 131; Britton, l. c. 356, fig. 863; Howe, 48 Rep. N. Y. Mus. Nat. Hist. 42. *C. leporina*, Mich. Fl. ii. 170, not L. *C. lagopodioides*, var. *scoparia*, Boeckeler, l. c. 114. — Low grounds or even dry open woods, NEWFOUNDLAND to SASKATCHEWAN and OREGON, and southward. May–August.

Var. *MONILIFORMIS*, Tuck. Spikelets scattered in a slender *moniliform spike*, the lowest usually remote. — Enum. Meth. 8, 17; Boott, Ill. l. c. t. 368, in part. *C. tribuloides*, var. *reducta*, Bailey, Proc. Am. Acad. xxii. 147, as to syn., in part. *C. tribuloides*, var. *moniliformis*, Britton, l. c. as to syn., in part. — Range of species, but infrequent.

Var. *condensa*. — Fig. 5. — *Spikelets spreading, crowded* in a short globose or broad-ovoid head. — NEW HAMPSHIRE, Randolph, July 23, 1897 (*E. F. Williams*): VERMONT, Westmore, July 26, 1894 (*E. F. Williams*); Rutland, July 14, 1899 (*W. W. Eggleston*): MASSACHUSETTS, Tewksbury, July 21, 1858, Medford, July 26, 1865, Mystic Pond, Aug. 9, 1868, and July 20, 1873 (*Wm. Boott*): RHODE ISLAND, Providence, July 19, 1871 (*S. T. Olney*): CONNECTICUT, Griswold, June 16, 1899 (*C. B. Graves*, no. 150): NEW YORK, Jefferson Co. (*Crave*); Fulton Chain Lakes, August, 1895 (*J. V. Haber*): ONTARIO, Courtland, June 26, 1901 (*John Macoun*, Herb. Geol. Surv. Can., no. 26,631).

= = Perigynia 3.7 to barely 5 (average 4.5) mm. long.

3. *C. TRIBULOIDES*, Wahlenb. — Figs. 6, 7. — Culms loose and usually tall, 0.3 to 1 m. high, sharply trigonous: *leaves soft and loose, 3 to 8 mm. broad, numerous*; the upper often nearly or quite overtopping the culm; *those of the sterile shoots crowded and somewhat distichous: spike oblong, of 8 to 14 obovoid ascending more or less crowded gray-green or dull brown spikelets 7 to 12 mm. long: perigynia with appressed tips.* — Königl. Acad. Handl. xxiv. 145, and Fl. Lapp. 250; Bailey, Proc. Am. Acad. l. c., in Gray, l. c., & Mem. Torr. Cl. i. 54; Macoun, l. c. 130; Britton, l. c. fig. 862; Howe, l. c. 41. *C. lagopodioides*, Schkuhr in Willd. l. c., & Riedgr. Nachtr. 20, t. Yyy, fig. 177; Dewey, l. c. 95; Schwein. & Torr. l. c.; Carey, l. c.; Boott, Ill. l. c. t. 370; Boeckeler, l. c. 113. *C. scoparia* var. *lagopodioides*, Torr. Ann. Lyc. N. Y. iii. 394; Tuck. ll. cc. — Swales and rich open woods, particularly in alluvial soil, NEW BRUNSWICK to SASKATCHEWAN, and southward. June–Sept.

Var. *TURBATA*, Bailey. Spikelets remote, forming a *moniliform spike*. — Mem. Torr. Cl. i. 55, & in Gray, Man, l. c. — *C. lagopodioides*, var. Boott, l. c. 117, t. 371, fig. 1. — Range of species.

Var. *REDUCTA*, Bailey. — Fig. 8. — *Spike* usually *flexuous*, at least the *lowest spikelets scattered: perigynia with loosely spreading or recurved tips*. — Proc. Am. Acad. l. c., Mem. Torr. Cl. i. 56, & in Gray, l. c.; Macoun, l. c.; Howe, l. c. 42. *C. cristata*, Kunze, Car. t. 44, fig. *g*; Boott, l. c. 117, in part, t. 373; not Schwein. *C. lagopodioides*, var. *moniliformis*, Olney, Exsicc. fasc. ii. no. 8; Bailey, Bot. Gaz. x. 380. *C. tribuloides*, var. *moniliformis*, Britton, l. c., not *C. scoparia*, var. *moniliformis*, Tuck. — GULF OF ST. LAWRENCE to NOVA SCOTIA, NEW ENGLAND, NEW YORK, IOWA, and western ONTARIO; ascending in the White Mts. to 1,385 m. altitude.

+ + Perigynia firm, not scale-like, obviously distended over the achenes.

++ Plant strongly stoloniferous; culms rising from an elongated rootstock.

4. *C. SICCATA*, Dewey. — Figs. 9 to 11. — Culms slender, 1 to 6 dm. high; leaves stiff, 1 to 3 mm. wide: spike of 3 to 7 approximate or scattered, glossy brown spikelets, the staminate and pistillate flowers variously mixed or in distinct spikelets: perigynia 5 or 6 mm. long, 2 mm. broad, usually with distinct serrulate wings. — Am. Jour. Sci. x. 278, t. F. fig. 18; Hook. Fl. Bor.-Am. ii. 212; Torr. l. c. 391; Carey, l. c. 539; Boott, Ill. i. 19, t. 52; Boeckeler, l. c. 134; Bailey, Proc. Am. Acad. l. c. 147, & in Gray, l. c. 619; Macoun, l. c. 114; Britton, l. c. 355, fig. 860; Howe, l. c. 47; Meinsh. Acta Hort. Petrop. xviii. 319. *C. pallida*, C. A. Meyer, Mém. Acad. St. Petersb. i. 215, t. 8. *C. Liddoni*, Carey, l. c. 545, not Boott. — Dry or sandy soil, VERMONT to BRITISH COLUMBIA and ALASKA, south to MASSACHUSETTS, CONNECTICUT, NEW YORK, OHIO, MICHIGAN and westward. May-July.

++ + Plant not strongly stoloniferous, culms solitary or in dense stools.

= Perigynia at most 1.4 mm. wide, elongate-lanceolate or subulate, 3.5 to 4 (rarely 4.5) mm. long.

a. Tips of perigynia conspicuously exceeding the lance-subulate scales: plant comparatively low, in dense stools.

5. *C. Crawfordii*. — Figs. 12, 13. — Very slender, 1 to 3 dm. high; the narrow (1 to 2.5 mm. wide) leaves ascending, often equalling or exceeding the culms: spike dull brown, oblong or ovoid, often subtended by an elongate-filiform bract; the 3 to 12 oblong or narrowly ovoid

ascending *spikelets* 3 to 7 mm. long, approximate: the linear-lanceolate perigynia plump at base, about 1 mm. wide. — *C. scoparia*, var. *minor*, Boott, Ill. iii. 116, t. 369; Gray, Man. ed. 5, 579; Bailey in Gray, Man. ed. 6, 621; Howe, l. c. 43. — Dry or rocky soil, or open woods. NEWFOUNDLAND, Whitbourne, Aug. 15, 1894 (*Robinson & Schrenk*, no. 94): PRINCE EDWARD ISLAND, Tignish, July 20, 1888 (*J. Macoun*, Herb. Geol. Surv. Can. no. 30,382): NEW BRUNSWICK, Nepisiquit Lakes, July, 1884 (*J. Brittain*, Herb. Geol. Surv. Canada, no. 30,377): QUEBEC, Rivière du Loup, Aug. 2, 1896, Lake Edward, Aug. 21, 1896, Tadoussac, Aug. 26, 1896 (*Ezra Brainerd*); Roberval, July 27, 1892 (*G. G. Kennedy*): MANITOBA, Lake Winnipeg, July 29, 1884 (*John Macoun*, Herb. Geol. Surv. Can., no. 30,307, in part): ASSINIBOIA, Cypress Hills, June 25, 1894 (*J. Macoun*, Herb. Geol. Surv. Can., no. 7,461): SASKATCHEWAN, Carleton House and Bear Lake (*Sir John Richardson*): ATHABASCA (*Sir John Richardson*, Herb. Geol. Surv. Can. no. 30,396): MAINE, Van Buren, July 25, 1893 (*M. L. Fernald*, no. 163); St. Francis, Aug. 7, 1893, Farmington, July 8, 1896 (*M. L. Fernald*); Beech Mt., Mount Desert Island, Aug. 20, 1890, Somesville, July 5, 1891, Southwest Harbor, Aug. 1, 1892, Little Cranberry Isle, July 10, 1894, Seal Harbor, July 5, 1897 (*E. L. Rand*); Gilead, Aug., 1897 (*Kate Furbish*): NEW HAMPSHIRE, Randolph, July 23, 1897 (*E. F. Williams*); near Crawfords, July 6, 1878, Mt. Washington, July 29, 1887, Franconia, July 6, 1878 (*E. & C. E. Faxon*); Crawford Notch, Aug. 24, 1891, Aug. 13, 1897, and Lebanon, July 22, 1890 (*G. G. Kennedy*): VERMONT, Mt. Mansfield, July 24, 1884 (*C. W. Swan*), Sept. 9, 1897 (*E. Brainerd*); Willoughby, July 21, 1896 (*G. G. Kennedy*); Middlebury, July 11, 1896, Ripton, July 19, 1898 (*E. Brainerd*); Rutland, July 1, 1899 (*W. W. Eggleston*): MASSACHUSETTS, Malden and Revere, June 21, 1879 (*H. A. Young*); Chelsea, July 19, 1891 (*W. P. Rich*): MICHIGAN, Houghton, Sept. 15, 1871 (*H. Gillman*); Keweenaw Co., Sept., 1888 (*O. A. Farwell*).

Var. *vigens*. — Fig. 14. — Stoutier throughout: culms 3 to 6 dm. high: leaves 2.5 to 3 mm. broad: *spikelets* mostly greener, 8 to 11 mm. long, densely crowded in a broad-ovoid to globose head. — Thickets and damp gravelly soil. NEW BRUNSWICK, Campbellton, July 20, 1880 (*R. Chalmers*, Herb. Geol. Surv. Can. no. 30,363): QUEBEC, Gaspé, Aug. 1, 1882 (*John Macoun*); Rivière du Loup, July 20 and Aug. 4, 1896, Lake Edward, Aug. 21, 1896 (*Ezra Brainerd*): ONTARIO, Eastmans Springs, Sept. 16, 1892 (*J. Macoun*, Herb. Geol. Surv. Can. no. 30,386); Cache Lake, July 11, 1900 (*John Macoun*): SASKATCHEWAN,

plains, Aug. 1, 1872 (*J. Macoun*): BRITISH COLUMBIA, Nelson, Kootenay Lake, July 3, 1890 (*J. Macoun*, Herb. Geol. Surv. Can., no. 30, 393): MAINE, St. Francis, Aug. 9, 1893, Sherman, Aug. 23, 1897 (*M. L. Fernald*): NEW HAMPSHIRE, Randolph, Aug. 2, 1897 (*E. F. Williams*); Mt. Washington, July 28, 1861 (*Wm. Boott*); Mt. Pleasant House, July 31, 1897 (*W. Deane*): VERMONT, Burlington, July 13, 1896 (*E. Brainerd*): MICHIGAN, Keweenaw Co., Aug., 1890 (*O. A. Farwell*).

b. Tips of perigynia mostly equalled by the ovate blunt or acutish scales: plant tall, forming loose stools.

6. *C. oronensis*. — Figs. 15, 16. — Culms tall and erect, 0.5 to 1 m. high, sharply angled and harsh above: leaves smooth, 2.5 to 4 mm. broad, much shorter than the culms: *spike oblong-cylindric, erect*, of 3 to 9 ascending dark brown rhomboid-ovoid pointed spikelets 0.5 to 1 cm. long: *scales mostly glossy brown, with pale scarious margins: perigynia appressed, about 4 mm. long, 1.3 mm. broad, very narrowly winged above*. — Dry fields, thickets, open woods, and gravelly banks. MAINE, Orono, about 1870 (*F. Lamson-Scribner*), June 28, 1890, June 30, 1891, July 3, 1897 (*M. L. Fernald*).

= = Perigynia 1.5 to 2 mm. broad, ovate-lanceolate, 4.5 to 6.5 (average 5) mm. long.

7. *C. PRATICOLA*, Rydberg. — Figs. 17, 18. — Culms smooth and slender, 3 to 6 dm. high, overtopping the smoothish flat (2 to 3.5 mm. broad) leaves; *spike slender, flexuous, moniliform, the 3 to 7 silvery brown mostly remote pointed spikelets few-flowered*, 7 to 1.7 mm. long, mostly long-clavate at base; perigynia nerveless or minutely short-nerved on the inner face, equalling the ovate-lanceolate acutish or blunt scales. — Mem. N. Y. Bot. Gard. i. 84; Britton, Man. 226. *C. pratensis*, Drejer, Rev. Crit. Car. Bor. 24; Fl. Dan. xiv. 8, t. 2368; Bailey, Proc. Am. Acad. xxii. 147; Britton, in Britt. & Brown, l. c. 354, fig. 858; not Hose. *C. adusta*, var. *minor*, Boott in Hook. Fl. Bor.-Am. ii. 215, & Ill. iii. 119, t. 383. *C. Liddoni*, in part, of authors, not Boott. — Open woods, clearings, and prairies, LABRADOR to SASKATCHEWAN and BRITISH COLUMBIA, south to NOVA SCOTIA, Aroostook County, MAINE, LAKE SUPERIOR, and NORTH DAKOTA; also in GREENLAND. June-Aug.

* * Mature perigynia distinctly more than one-third (.44 to .75) as broad as long.

+ Perigynia one-fifth to one-third (.19 to .34) as thick as broad (rarely thicker in *C. mirabilis*).

++ Mature perigynia 3 to 4 mm. long (very rarely longer in *C. mirabilis* and *C. albolutescens*).

= Mature perigynia with roseate-spreading tips.

8. *C. CRISTATA*, Schweinitz. — Figs. 19 to 21. — Culms 1 m. or less high, *harsh above: leaves soft and flat, 3 to 7 mm. broad*, often equalling the culms, *sheaths loose: spike usually dense, linear-cylindric or oblong*, of 6 to 15 *globose closely flowered* greenish or dull-brown *spikelets* 0.5 to 1 cm. long. — Ann. Lyc. N. Y. i. 66; Schwein. & Torr. Ann. Lyc. N. Y. i. 315, t. 24, fig. 1; Dewey, l. c. 44; Boott, l. c. 117, in part; Gray, Man. ed. 5, 579; Boeckeler, l. c. 115; Howe, l. c. 41. *C. lagopodioides*, var. *cristata*, Carey, l. c. 545. *C. straminea*, var. *cristata*, Tuck. l. c. 9, 18. *C. tribuloides*, var. *cristata*, Bailey, Proc. Am. Acad. xxii. 148, in Gray, Man. ed. 6, 620, & Mem. Torr. Cl. i. 55; Macoun, l. c. 130. *C. cristatella*, Britton, l. c. 357, fig. 865. — Swales and wet woods, western NEW ENGLAND to PENNSYLVANIA, "VIRGINIA," MISSOURI, SASKATCHEWAN, and BRITISH COLUMBIA. June-Aug.

= = Mature perigynia with ascending tips.

a. Plant stout and stiff: spikes stiff and upright; the gray-green mostly approximate spikelets with appressed firm perigynia.

9. *C. ALBOLUTESCENS*, Schweinitz. — Figs. 22 to 24. — Culms 2 to 8 dm. high: *leaves erect, long-pointed, pale green, 2 to 5 mm. wide*, shorter than the culms: *spike linear-cylindric to subglobose*, with or without elongated bracts, of 3 to 30 (sometimes compound) conic-ovoid to subglobose spikelets 0.6 to 1 cm. long: *perigynia 2 to 3 mm. broad, rhombic-ovate to suborbicular, with a short deltoid firm greenish tip*. — Ann. Lyc. N. Y. i. 66; Bailey, Bull. Torr. Cl. xx. 422 (incl. var. *cumulata*); Britton, l. c. 359, fig. 873; Howe, l. c. 43. *C. foenea*, Ell. Sk. ii. 533; Schwein. & Torr. l. c. 315; Carey, l. c. 546; Boott, l. c. 118 (excl. vars.), t. 375; not Willd. *C. straminea*, var. *foenea*, Torr. Ann. Lyc. N. Y. iii. 395; Bailey, Proc. Am. Acad. xxii. 150, & in Gray, Man. ed. 6, 622; Macoun, l. c. 132. *C. straminea*, var. *intermedia*, Gay, Ann. Sci. Nat. ser. 2, x. 364. *C. leporina*, var. *bracteata*, Liebm. Mex. Halv. 76. *C. straminea*, var. *chlorostachya*, Boeckeler, l. c. 118. *C. straminea*, var. *cumulata*, Bailey, Mem. Torr.

Cl. i. 23, & in Gray, l. c. — Damp or even very dry soil, principally on the coastal plain, NEW BRUNSWICK to FLORIDA, TEXAS, MEXICO, and CENTRAL AMERICA; rarely inland to Bear Mt., Livermore, MAINE (*Kate Furbish*); Mt. Monadnock, alt. 925 m., NEW HAMPSHIRE (*R. M. Harper*); Taghkanick Range, Columbia Co., NEW YORK (*L. H. Hoysradt*); also from LAKE HURON to MANITOBA. July–Sept.

b. Plant not very stiff: the bright green or brownish spikelets with spreading or ascending (not appressed) perigynia.

1. Leaves 2.5 to 6 mm. wide: culms 0.3 to 1.5 m. high.

10. *C. MIRABILIS*, Dewey. — Figs. 25, 26. — Culms very loose and smooth; leaves soft and thin, the sheaths rather loose: spikelets 4 to 12, greenish, subglobose or ovoid, 5 to 9 mm. long, mostly approximate in an oblong spike; perigynia with divergent tips. — Am. Jour. Sci. xxx. 63, t. Bb, fig. 92; Boott, l. c. 117 (under *C. cristata*), t. 374; Howe, l. c. 46. *C. straminea*, var. *mirabilis*, Tuck. l. c. 9, 18; Bailey, Proc. Am. Acad. xxii. 150, & in Gray, Man. ed. 6, 621; Britton, l. c. 358. *C. festucacea*, var. *mirabilis*, Carey, l. c. 545. *C. cristata*, Kunze, Car. t. 44, figs. a, e, and f (colored), not Schwein. *C. cristata*, var. *mirabilis*, Gray, Man. ed. 5, 580. *C. lagopodioides*, var. *mirabilis*, Olney, Exsicc. fasc. ii, no. 9. *C. tribuloides*, var. *cristata*, Macoun, l. c. 130, in part, not Bailey. — Dry banks, open woods, or even moist copses, central MAINE to MANITOBA, south to NORTH CAROLINA and MISSOURI. June, July.

Var. *perlonga*. — Fig. 27. — Spikelets scattered in a moniliform spike. — NEW HAMPSHIRE, dry thicket, Barrett Mt., New Ipswich, June 5, 1896 (*M. L. Fernald*); VERMONT, Little Notch, July 9, 1901 (*E. Brainerd*); MASSACHUSETTS, Stoneham, June 5, 1887 (*F. S. Collins*); Oak Island, Revere, July 5, 1891 (*W. P. Rich*); Beaver Brook Reservation, July 6, 1894 (*C. W. Swan*); Sharon, June 17, 1896 (*W. P. Rich*); CONNECTICUT, dry open woods, Southington, June 17, 1900 (*C. H. Bissell*); NEW YORK, Binghamton, June 29, 1871 (*Wm. Boott*); Sacondago River (*J. V. Haberer*); MICHIGAN, Grosse Isle, June 30, 1867 (*Wm. Boott*); open swales, Lansing, June 8, 1886 (*L. H. Bailey*, no. 283, in part); ILLINOIS, Marion Co. (*M. S. Bebb*).

Var. *tincta*. Spike of 3 to 7 ovoid approximate brown-tinged spikelets: scale brown with a pale margin. — NEW BRUNSWICK, banks of St. John River, July 4, 1899 (*J. Macoun*, Herb. Geol. Surv. Can. no. 22); MAINE, Fort Kent, June 16, 1898 (no. 2158), Masardis, June 6, 1898 (no. 2159), Ashland, June 13, 1898 (no. 2160), Fort Fairfield,

July 12, 1893 (no. 165), Foxcroft, June 25, 1894, Dover, June 28, 1894, Orono, July 6, 1891,—all coll. *M. L. Fernald*; Sangerville, July 17, 1896 (*G. B. Fernald*, no. 176): NEW HAMPSHIRE, between Marshfield and Fabyans, July 6, 1878, Bethlehem, June 20, 1887 (*E. & C. E. Faxon*); Whitefield, July 3, 1896 (*W. Deane*): VERMONT, St. Johnsbury, June 21, 1901 (*T. E. Hazen*, no. 206). Resembling north-western forms of the polymorphous *festiva* group, but not satisfactorily referable to any of them.

2. Leaves 0.5 to 2 mm. wide: culms 3 to 7 dm. high: spikelets remote or at least distinct in a moniliform or linear-cylindric spike.

11. *C. STRAMINEA*, Willd. — Figs. 28, 29. — Culms very slender, smooth except at summit: spikelets 3 to 8, yellow-brown, or rarely green, ovoid or subglobose, 4 to 8 mm. long, usually forming flexuous spikes: perigynia with ascending inconspicuous tips; the inner faces 3- to 5-nerved or nerveless. — Willd. in Schkuhr, Riedgr. 49, t. G, fig. 34; Bailey, Mem. Torr. Cl. i. 21, & in Gray, Man. ed. 6, 621; Britton, l. c. fig. 868; Howe, l. c. 44. *C. straminea*, var. *minor*, Dewey, Am. Jour. Sci. xi. 318, t. N, fig. 45; Torr. l. c. 395. *C. festuacea*, var. *tenera*, Carey, l. c. 545. *C. straminea*, var. *tenera*, Boott, l. c. 120, t. 384 (except perigynia from Olney); Gray, Man. ed. 5, 580; Macoun, l. c. 132. — Meadows, or occasionally on dry banks or in open woods, NEW ENGLAND to BRITISH COLUMBIA, KENTUCKY and ARKANSAS. June-Aug.

Var. *echinodes*. — Fig. 30. — Tips of the slightly longer perigynia divergent and conspicuous. — ONTARIO, Wyoming, June 24, 1901 (*J. Macoun*, Herb. Geol. Surv. Can., no. 26,624): MICHIGAN, Detroit, July 20, 1867 (*H. P. Sartwell*), June 26, 1870, and June 22, 1873 (*Wm. Boott*): IOWA, Ames, 1872, Spirit Lake, June 21, 1881 (*J. C. Arthur*). Superficially resembling *C. tribuloides*, var. *reducta*.

↔ ↔ Mature perigynia more than 4 mm. long (very rarely shorter in exceptional individuals of *C. tenera*, var. *invisa*, and *C. festuacea*, var. *brevior*).

= Perigynia elongate-ovate, about half as broad as long (suborbicular in var. *Richii*).

12. *C. TENERA*, Dewey. — Figs. 31, 32. — Culms slender and flexuous, sharply angled, smooth except at summit, 3 to 9 dm. high: leaves shorter than or rarely exceeding the culms, very ascending, 1 to 2.5 mm. broad: spike slender, moniliform (or on late culms more or less congested), of 3 to 9 broadly ovoid brownish spikelets 8 to 12 mm. long, with

or without subtending elongated bracts: *perigynia* ascending or rarely spreading, *distinctly about 10-nerved on either face, 4.8 to 6 (average 5.2) mm. long*: scales lance-attenuate or aristate. — Am. Jour. Sci. viii. 97, & ix. t. C, fig. 9; Britton, l. c. fig. 870. *C. straminea*, var. *aperta*, Boott, l. c. 120, t. 385; Gray, Man. ed. 5, 580; Bailey, Proc. Am. Acad. xxii. 152, & in Gray, Man. ed. 6, 622; Macoun, l. c. 133; Howe, l. c. 45. *C. tenera*, var. *major*, Olney, l. c. no. 15. *C. straminea*, var. *tenera*, Bailey, Bot. Gaz. x. 381, & Mem. Torr. Cl. v. 94. — Brackish or fresh marshes, mostly near the coast, GULF OF ST. LAWRENCE to DELAWARE and IOWA; also in BRITISH COLUMBIA, Yellow Head Pass (*Spreadborough*, Herb. Geol. Surv. Can. no. 20,871). June–Aug.

Var. *INVIS*A, Britton. — Figs. 35, 36. — Lower; with *spikelets 5 to 8 mm. long*, and *perigynia 4 to 5 (average 4.5) mm. long*. — Britton, l. c. 358. *C. straminea*, var. *invisa*, W. Boott, Bot. Gaz. ix. 86; Bailey, Proc. Am. Acad. xxii. 152, & in Gray, Man. ed. 6, 622; Howe, l. c. — Range of the species and too often intergrading with it; mostly in dry soil or even in pure sand.

Var. *Richii*. — Figs. 33, 34. — *Perigynia 4 to 5 mm. long, with suborbicular bodies abruptly contracted to slender conspicuous loosely ascending or spreading beaks*. — MASSACHUSETTS, Reading, June 14, 1883 (*C. E. Perkins*); Fresh Pond, Cambridge, June 8, 1887 (*W. Deane*); near Spot Pond, and north end of Doleful Pond, Stoneham, May 30, 1894, near Bear Hill, Stoneham, June 5, 1894 (*Wm. P. Rich*); Amherst (*E. Tuckerman*): CONNECTICUT, Newington, May, 1879 (*Chas. Wright*). In its elongate loose brown spikes and subulate- or awn-tipped narrow scales clearly an extreme form of *C. tenera*, although the *perigynia* when well developed suggest those of *C. festuacea*.

= = *Perigynia* with broadly ovate to suborbicular bodies, more than half as broad as long.

a. *Perigynia 5.7 to 7.7 mm. long*.

13. *C. BICKNELLII*, Britton. — Figs. 37 to 40. — Culms comparatively stout, 4 to 9 dm. high, smooth except at summit: leaves ascending, rather short and firm, 2 to 4.5 mm. broad: *spike of 3 to 7 silvery brown or greenish ovoid obovoid or subglobose approximate or slightly remote spikelets 8 to 14 mm. long: perigynia ascending, the tips becoming conspicuous, broadly wing-margined, when mature almost translucent and with about 10 nerves on either face*. — Britton, l. c. 360, fig. 874. *C. straminea*, var. *Crawei*, Boott, l. c. 121, t. 388; Bailey, Bull. Torr. Cl. xx. 422; Howe, l. c. *C. straminea*, var. *Meadei*, Boott, l. c. t. 389; Gray,

Man. ed. 5, 581. *C. straminea*, var. *brevior*, Bailey, Mem. Torr. Cl. i. 22, in part, not Dewey. — Dry or rocky soil, eastern MASSACHUSETTS to MANITOBA, NEW JERSEY, OHIO, and ARKANSAS. May–July.

b. Perigynia at most 5.5 mm. long.

1. Spikelets whitish or silvery-brown, mostly scattered in a flexuous moniliform spike.

14. *C. SILICEA*, Olney. — Figs. 41, 42. — Culms slender, stiff, smooth except at summit, 3 to 8 dm. high: leaves erectish, shorter than or equalling the culms, usually glaucous, 2 to 4.5 mm. wide, often becoming involute: spike of 3 to 12 usually remote conic-ovoid usually clavate spikelets 1 to 1.5 cm. long: perigynia strongly appressed, firm and opaque, 4 to 5 mm. long, 2.2 to 3 mm. broad, short-beaked, broad-winged, the body distinctly 3- to 5-nerved on the inner, 6- to 12-nerved on the outer face. — Proc. Am. Acad. vii. 393; Bailey, Mem. Torr. Cl. i. 24, & in Gray, Man. ed. 6, 621; Britton, l. c. 358, fig. 869; Howe, l. c. 44. *C. straminea*, var. *moniliformis*, Tuck. l. c. 9, 17; Bailey, Proc. Am. Acad. xxii. 151; Macoun, l. c. 133. *C. adusta*, Carey in Gray, Man. ed. 2, 516, not Boott. *C. foenea*, var. γ , Boott, l. c. 118, t. 377. *C. foenea*, var. (?) *subulonum*, Gray, Man. ed. 5, 580. *C. straminea*, var. *silicea*, Bailey, Carex Cat. 4. — Sand and rocks near the sea, PRINCE EDWARD ISLAND to NEW JERSEY. June–Aug.

2. Spikelets green or brownish, approximate or only slightly remote in a mostly upright spike (*C. tenera*, var. *Richii*, with moniliform flexuous spikes might be looked for here).
- Sheath of the leaf green and strongly nerved nearly or quite to the narrow subchartaceous auricle: perigynia appressed-ascending: achenes mostly oblong.

15. *C. ALATA*, Torr. — Figs. 43, 44. — Culms rather stout, smooth except at summit, 0.5 to 1 m. high: leaves mostly short and harsh, 2.5 to 4.5 mm. wide: spike oblong or ovoid, of 3 to 8 compact green or finally dull-brown conic-ovoid to oblong spikelets 8 to 15 mm. long: perigynia firm and opaque, orbicular or obovate, 4.3 to 5.5 mm. long, 2.8 to 3.7 mm. broad, broad-winged, very faintly nerved or nerveless, much broader than the lance-subulate usually rough-awned scales. — Ann. Lyc. N. Y. iii. 396; Boott, l. c. 118, t. 378; Gray, Man. ed. 5, 581; Britton, l. c. 359, fig. 872; Howe, l. c. 45. *C. straminea*, var. *alata*, Bailey, Carex Cat. 4, Proc. Am. Acad. xxii. 150 & in Gray, Man. ed. 6, 622. — Marshes and wet woods, NEW HAMPSHIRE to MICHIGAN and FLORIDA, mostly near the coast. June, July.

Var. *ferruginea*. — Figs. 45, 46. — Slender: the 3 to 5 irregularly clustered spikelets tawny or ferrugineous from the first: perigynia ovate, 4 to 5 mm. long, 2.3 to 2.8 mm. broad: scales lance-ovate, mostly awnless. — *C. foenea*, var. β , Boott, l. c. 118, t. 376. *C. foenea*, var. ? *ferruginea*, Gray, Man. ed. 5, 580. *C. tenera*, var. *suberecta*, Olney, Exsicc. fasc. ii. no. 16. *C. straminea*, var. *ferruginea*, Bailey, Bull. Torr. Cl. xx. 421. — OHIO to MICHIGAN, ILLINOIS, and IOWA.

○ ○ Sheath with a thin barely nerved or nerveless pale band extending down from the membranaceous auricle: perigynia spreading-ascending: achenes suborbicular.

16. *C. FESTUCACEA*, Schkuhr. — Figs. 47, 48. — Culms stiff, 0.5 to 1 m. high: leaves stiff, erect, shorter than the culms, 2 to 4 mm. wide: spike narrowly oblong, rarely ovoid, of 5 to 10 distinct or rarely approximate subglobose or broadly ovoid-conic yellow-brown or green-brown ascending spikelets 7 to 12 mm. long: perigynia broad-ovate to suborbicular, 4 to 5.5 mm. long, 2.7 to 3.5 mm. broad, strongly 7- to 15-nerved on the outer, nerveless or faintly nerved on the inner face: scales blunt. — Schkuhr in Willd. Sp. iv. 242, & Riedgr. Nachtr. 23, t. Wwv. fig. 173; Dewey, Am. Jour. Sci. viii. 96; Schwein. & Torr. l. c. 316; Torr. l. c. 394; Carey, l. c. 545; Britton, l. c. 359, in part. *C. straminea*, var. *festucacea*, Tuck. l. c. 9, 18; Boott, l. c. 120, t. 386; Macoun, l. c. 132; Bailey, Mem. Torr. Cl. v. 94, in part; Howe, l. c. *C. straminea*, Bailey, Proc. Am. Acad. xxii. 149, in part, not Willd. *C. straminea*, var. *brevior*, Bailey, Mem. Torr. Cl. i. 22, in part, not Dewey. — Dry or rocky soil, MAINE to MANITOBA and PENNSYLVANIA. June–Aug.

Var. *brevior*. — Figs. 49 to 51. — Lower (rarely more than 0.6 m. high), and more slender: spikelets 3 to 6, approximate or subapproximate. — *C. straminea*, Schkuhr, Riedgr. Nachtr. 23, t. Xxx, fig. 174; Schwein. & Torr. l. c. 314; Carey, l. c. 546; Torr. l. c. 395; Boott, l. c. 121, t. 387; Bailey, Proc. Am. Acad. xxii. 149, in part; not Willd. in Schkuhr, Riedgr. 49, t. G. fig. 34, & in herb. *C. straminea*, var. *brevior*, Dewey, Am. Jour. Sci. xi. 158; Bailey, Mem. Torr. Cl. i. 22, in part, & in Gray, Man. ed. 6, 622; Howe, l. c. *C. straminea*, var. *Schkuhrii*, Gay, Ann. Sci. Nat. ser. 2, x. 363; Tuck. l. c. 8, 17. *C. straminea*, var. *typica*, Gray, Man. ed. 5, 580; Macoun, l. c. 131. *C. festucacea*, Britton, l. c. 359, in part (including fig. 871), not Schkuhr. — Commoner than the species, extending to BRITISH COLUMBIA, ARKANSAS, &c. May–July.

— — Perigynia two-fifths to one-half (.40 to .50) as thick as broad.

↔ Tips of the perigynia distinctly exceeding the scales: spikes short, compact, ovoid or short-oblong, brown: perigynia 3 to 3.5 mm. long.

17. *C. BEBBII*, Olney. — Figs. 52, 53. — Culms rather slender, 2 to 6 dm. high, smooth except at tip: leaves mostly shorter, ascending but not stiff, 1.75 to 4.5 mm. wide: spikes 1 to 2 cm. long, of 3 to 12 globose or ovoid-oblong ascending spikelets 5 to 8 mm. long: perigynia narrowly ovate, mostly dull brown and loosely ascending, faintly few-nerved or nerveless, 1.5 to 2 mm. broad: scale oblong, bluntly acuminate. — Exsicc. fasc. ii, no. 12, as *nomen nudum*. *C. tribuloides*, var. *Bebbii*, Bailey, Mem. Torr. Cl. i, 55 & in Gray, Man. ed. 6, 620; Britton, l. c. 356; Howe, l. c. 42; Cratty, Bull. Lab. Nat. Hist. Univ. Ia., iv. 359, t. 8. — Low ground, NEWFOUNDLAND to western MASSACHUSETTS, central NEW YORK, ILLINOIS, the ROCKY MTS., BRITISH COLUMBIA, and northward. June-Aug.

↔ ↔ Tips of the perigynia nearly or quite equalled by the scales: perigynia more than 3.5 mm. long (sometimes shorter in the slender-spiked silvery green *C. foenea*).

≡ Perigynia with strong nerves the entire length of the inner face (very rarely nerveless).

α Spike loose and elongated, green or silvery-brown.

18. *C. FOENEA*, Willd. — Figs. 54, 55. — Culms slender and lax, smooth except at tip, 3 to 9 dm. high: leaves soft and loose, pale green or glaucous, mostly shorter, 2 to 4 mm. broad: spike linear-cylindric or moniliform, erect or flexuous, of 4 to 9 globose or ovoid clavate-narrowed appressed-ascending spikelets 6 to 10 mm. long: perigynia ovate, 3 to 4 mm. long, 1.8 to 2.2 mm. broad, appressed-ascending, finally a little spreading. — Enum. 957; Bailey, Mem. Torr. Cl. i. 25, & in Gray, Man. ed. 6, 621; Macoun, l. c. 377; Britton l. c. 357, fig. 867; Howe, l. c. 43. *C. argyrantha*, Tuck. in Herb. distr. (1859). *C. adusta*, Boott, l. c. 119, in part, t. 382, fig. 2, not Boott in Hook. Fl. Bor.-Am. ii. 215. *C. albolutescens*, var. *argyrantha*, Olney, Exsicc. fasc. i. no. 9. *C. adusta*, var. *argyrantha*, Bailey, Carex Cat. 2. — Dry woods and rocky banks, MAINE to BRITISH COLUMBIA and MARYLAND. July.

VAR. PERPLEXA, Bailey. — Figs. 56, 57. — Coarser, and often taller: spikes heavier, mostly nodding, the 6 to 15 spikelets larger, 1 to 1.7 cm. long, the terminal ones often crowded: perigynia 3.5 to 4.4 mm. long. — Mem. Torr. Cl. i. 27, in part, & in Gray, Man. Ed. 6, 621; Britton,

l. c.; Howe, l. c. 44. *C. adusta*, Boott, Ill. iii. 119, in part, t. 381, 382, fig. 1; Gray, Man. ed. 5, 580; Macoun, l. c. 129, in part (excl. syn.) — Commoner than the species. NEWFOUNDLAND to MANITOBA and VIRGINIA. June–Aug.

b. Spike with approximate or subapproximate brown or ferrugineous spikelets.

19. *C. LEPORINA*, L. — Figs. 58 to 60. — Culms stiff and ascending, 2 to 8 dm. high: leaves mostly short and rather firm, 1.5 to 4 mm. broad: spike from subglobose to cylindric, of 3 to 6 obovoid to oblong-ovoid ascending spikelets 8 to 1.4 mm. long: perigynia 3.8 to 4.5 mm. long, 1.8 to 2.3 mm. broad, ascending. — Sp. 973, & Fl. Suec. ed. 2, 326 (excl. cit. Fl. Lapp.); Wahl. Fl. Lapp. 228; Reich. Ic. Fl. Germ. viii. t. 211; Anders. Cyp. Scand. 63, t. 4, fig. 26; Boott, l. c. iv. 190; Bailey, Proc. Am. Acad. xxii. 152, & in Gray, Man. ed. 6, 622; Britton, l. c. 356, fig. 864; Meinsh. Acta Hort. Petrop. xviii. 324. *C. ovalis*, Good. Trans. Linn. Soc. ii. 148; Eng. Bot. t. 306; Vahl. Fl. Dan. vii. t. 1115; Host, Gram. i. 39, t. 51; Willd. l. c. 955; Schkuhr, l. c. 20, t. B, fig. 8. — EUROPE and ASIA: NEWFOUNDLAND, shores of Quiddy Viddy Lake, Aug. 2, 1894 (*Robinson & Schrenk*): NOVA SCOTIA, Yarmouth, July 22, 1896 (*E. Brainerd*): MAINE, low, rocky pasture, South Berwick, June 23, 1898 (*J. C. Parlin*, no. 959); hillside pastures, East Parsonsfield, July 4, 1900 (*J. F. Collins & M. L. Fernald*): NEW HAMPSHIRE, dry hillsides, Alstead, July 9, 1901 (*M. L. Fernald*); Gap Mt., Troy, June 13, 1898 (*E. L. Rand & B. L. Robinson*, no. 508): MASSACHUSETTS, Essex Co., Aug. 23, 1881 (*W. P. Conant*); Long Island, Boston Harbor, July 6, 1871, July 1, 1873 (*Wm. Boott*); Nobscot Hill, Framingham, June 14, 1901 (*M. L. Fernald*); Purgatory Swamp, Dedham, June 23, 1878 (*E. & C. E. Faxon*): NEW YORK, slopes of Bald Mt., north of Fulton Chain, Herkimer & Hamilton Cos., Aug. 12, 1895 (*J. V. Haberer*, no. 1103) NEW JERSEY, ballast ground, Camden, 1878 (*Isaac Burk*). Doubtless introduced at the latter station, but perhaps indigenous northward.

= = Inner face of perigynia nerveless or only slightly nerved at base (exceptional individuals of *C. leporina* might be sought here).

a. Ellipsoidal spikelets brownish-white: the appressed perigynia golden-yellow at base.

20. *C. XERANTICA*, Bailey. — Figs. 61, 62. — Culms stiff, scabrous above, 3 to 6 dm. high: leaves short, mostly near the base, 2 or 3 mm. broad: spike linear-cylindric, of 3 to 6 distinct ascending spikelets 8 to

13 mm. long: perigynia 4 to 4.8 mm. long, 2 to 2.3 mm. broad. — Bot. Gaz. xvii. 151; Britton, l. c. 355, fig. 859. — Open prairies, western MANITOBA and adjacent ASSINIBOIA. July.

b. Obovoid spikelets brownish or ferrugineous: the loosely ascending perigynia dark green or brown when mature.

1. Spike loose and flexuous; spikelets mostly long-clavate at base, the lowest remote: achene 1.5 (1.3 to 1.7) mm. broad.

21. *C. aenea*. — Figs. 63 to 66. — Culms smooth and wiry, but more or less flexuous at tip, 0.25 to 1.2 m. high: leaves much shorter, rather soft and flat, 2 to 4 mm. broad: spike loosely cylindric or moniliform, of 3 to 12 spikelets 0.8 to 2.5 cm. long (in luxuriant plants often peduncled or compound): perigynium 4 to 5 mm. long, 1.9 to 2.7 mm. broad. — *C. adusta*, Boott, l. c. iii. 119, in part, t. 380, not Boott in Hook. Fl. Bor.-Am. ii. 215. *C. albolutescens*, var. *sparsiflora*, Olney, fasc. v. no. 11, in part (as *nomen nudum*), not *C. sparsiflora* Fries. *C. adusta*, var. *sparsiflora*, Bailey, Carex Cat. 2 (as *nomen nudum*)? *C. foenea*, var. *perpleza*, Bailey, Mem. Torr. Cl. i. 27, as to syn., in part. *C. foenea*, var. *sparsiflora*, Howe, l. c. 44. — Open woods, dry banks, or rarely in low ground. LABRADOR, without station, Aug. 23, 1896 (*Spreadborough*, Herb. Geol. Surv. Can. no. 13,354): UNGAVA, East Main R., 1892 (*A. H. D. Ross*, Herb. Geol. Surv. Can. no. 30,582): NEWFOUNDLAND, Grand Lake, Bay of Islands, Aug. 6, 1897 (*A. C. Waghorne*): QUEBEC, Rivière du Loup, July 23, 1861 (*Wm. Boott*), Aug. 2, 1896 (*E. Brainerd*): CALUMET, June, 1891 (*J. M. Macoun*, Hb. Geol. Surv. Can. no. 16,535): NEW BRUNSWICK, Kent Co. (*J. Fowler*, in Olney, Exsicc. fasc. v. no. 11, in part): MAINE, Fort Fairfield, 1881 (*Kate Furbish*); Milford, June 30, 1864 (*J. Blake*); Orono, July 7, 1892, July 3, 1897, June 8, 1901 (*M. L. Fernald*); Mt. Desert Island, numerous stations (*Rand*, *Faxon*, *Williams et al.*): NEW HAMPSHIRE, Franconia, June 23, 1888 (*E. & C. E. Faxon*); Crawford Notch, July 16, 1895 (*G. G. Kennedy*): VERMONT, East Mt., Middlebury, June 23, 1882, Moosalamoo Mt., Salisbury, July 5, 1901 (*E. Brainerd*); MASSACHUSETTS, Mt. Wachusett, June 27, 1878 (*Wm. Boott*): NEW YORK, base of Stony Creek Mt., June 29, 1899 (*Rowlee*, *Wiegand & Hastings*): ONTARIO, near Michipicoten, July 26, 1869, Cache Lake, July 12, 14, 1900 (*J. Macoun*); Lake Victoria, Sept. 12, 1901 (*E. Brainerd*): MICHIGAN, Isle Royale (*H. Gillman*): ATHABASCA, Methy Portage (*Sir John Richardson*, fide Boott, Ill. t. 380): ALBERTA, Banff, Rocky Mts., July 10, 1891 (*J. Macoun*, Herb.

Geol. Surv. Can. no. 16, 536): BRITISH COLUMBIA, Beaver Creek, Selkirk Mts., July 13, 1885 (no. 10,797); Kicking Horse Lake, Aug. 11, 1890 (no. 30,603); Revelstoke, May 19, 1890 (no. 30,604) — *J. Macoun*, Herb. Geol. Surv. Can.

2. Spike dense and stiff, erect; spikelets full and rounded at base, mostly approximate: achene 2 (1.8 to 2.1) mm. broad.

22. *C. ADUSTA*, Boott. — Figs. 67 to 69. — Culms smooth, *stiffly erect*, 2 to 8 dm. high: leaves usually shorter, 2 to 5 mm. broad: *spike ovoid to cylindric, usually subtended by a stiff rather prominent bract*, of 3 to 15 simple or compound *spikelets 6 to 12 mm. long*: perigynia 4 to 5 mm. long, 2 to 3 mm. broad. — Boott in Hook. Fl. Bor.-Am. ii. 215, & Ill. iii. 119, in part, t. 379; Bailey Mem. Torr. Cl. i. 24, & in Gray, Man. ed. 6, 621; Britton, l. c. 357, fig. 866. *C. albolutescens*, var. *glomerata*, Olney, Exsicc. fasc. v. no. 10. *C. adusta*, var. *glomerata*, Bailey, Carex Cat. 2, Bot. Gaz. ix. 139, & Proc. Am. Acad. xxii. 149. *C. pinguis*, Bailey, Bull. iii. Geol. and Nat. Hist. Surv. Minn. 22; Macoun, l. c. 129. — Dry woods, rocky banks and recent clearings, NEWFOUNDLAND to Mount Desert Island, MAINE, west to MINNESOTA, ASSINIBOIA, SASKATCHEWAN, and KEEWATIN. June–Sept.

§§ CYPEROIDEAE. Bracts leaf-like and much prolonged, forming a conspicuous involucre.

23. *C. SYCHNOCEPHALA*, Carey. — Figs. 70, 71. — Culms smooth, 2 to 6 dm. high: *leaves soft, ascending*, 2 to 4 mm. wide; *bracts unequal, the lowest longest, 1 to 2 dm. long*: spikelets 4 to 10, oblong, 8 to 15 mm. long, *forming a dense ovoid or oblong spike*: perigynia lance-subulate, 5 mm. long, barely 1 mm. wide, firm, slightly nerved or nerveless. — Am. Jour. Sci. Ser. 2, iv. 24, & in Gray, Man. 545; Boott, Ill. i. 46, t. 118; Bailey, Proc. Am. Acad. xxii. 153; Macoun, l. c. 121; Britton, l. c. 360, fig. 875; Howe, l. c. 46; Cratty, Bull. Lab. Nat. Hist. Univ. Ia., iv. 363, t. 9. *C. cyperoides*, Dewey, Am. Jour. Sci. Ser. 2, iii. 171, not L. — Meadows, ditches, and wet sandy soil, locally from central NEW YORK to the Ottawa River (CANADA), IOWA, SASKATCHEWAN, and BRITISH COLUMBIA. July, Aug.

Astrostachyae, Holm. Monoecious or dioecious, the spikelets often purely staminate or purely pistillate, or with the flowers variously mixed. Bract not sheathing, if present short and filiform. *Perigynia horizontally spreading or reflexed at maturity, spongy at base*, glabrous, nervose, distinctly pointed or beaked, *with thin margins* and bidentate apex.

* Spikelets terminal and solitary (rarely one or two secondary ones below): plants usually dioecious.

+ Culms filiform or setaceous, solitary or few from filiform creeping stoloniferous rootstocks.

24. *C. GYNOCRATES*, Wormskjöld. — Figs. 72 to 77. — *Culms* 0.6 to 3 dm. high, *mostly exceeding the setaceous leaves*: spikelets 0.5 to 2 cm. long, some staminate and linear or linear-lanceolate, with oblong mostly blunt-pointed scales; others staminate above, with 1 or more pistillate flowers below; others oblong, strictly pistillate, with 6 to 12 *rather plump subterete, but thin-edged strongly nerved conic-beaked perigynia*. — Wormsk. in Drejer, Rev. 16; Fries, Mant. iii, 134, & Sum. 222; Anders. Cyp. Scand. 71, t. 3, fig. 8; Kunze, Car. 123, t. 31, fig. 1; Carey, in Gray, Man. ed. 2, 509; Boott, Ill. iv. 143, t. 459, 460; Bailey, Proc. Am. Acad. xxii. 142, & in Gray, Man. ed. 6, 617; Macoun, l. c. 109; Howe, l. c. 49 (incl. var. *monosperma*, Peck); Holm, l. c. 209. *C. Redowskiana*, Bailey, Mem. Torr. Cl. v. 89; Britton, l. c. 340, fig. 815; not C. A. Meyer, according to Meinshausen, Acta Hort. Petrop. xviii. 305. *C. dioica*, Schwein. & Torr. l. c. 293; Dewey, l. c. Ser. 1, x. 283; Carey, in Gray, Man. 537; not L. *C. monosperma*, Macoun, in Bailey, Carex Cat. 3, *nomen nudum*. *C. alascana*, Boeckeler, Engler's Bot. Jahrb. vii. 277, acc. to Bailey. — Swamps and bogs, LABRADOR to ALASKA, south mostly in *Thuya* swamps to Restigouche Co., NEW BRUNSWICK; Aroostook and Piscataquis Cos., MAINE; Herkimer, Yates and Genessee Cos., NEW YORK; Alleghany Co., PENNSYLVANIA; and Alcona and Oscoda Cos., MICHIGAN; in the Rocky Mts. to COLORADO: also in northern EUROPE and ASIA. June, July.

+ — Culms stouter, rigid, forming strongly caespitose stools without stolons.

25. *C. EXILIS*, Dewey. — Figs. 78 to 83. — *Culms* wiry, 2 to 7 dm. high, usually much exceeding the *filiform stiff leaves*: spikelets mostly solitary, 1 to 3 cm. long, staminate, or pistillate, or with the flowers variously situated: *perigynia* ovate-lanceolate, *with serrulate thin margins, strongly convex on the outer, flattish and few-nerved or nerveless on the inner face*. — Am. Jour. Sci. xiv. 351, t. Q, fig. 53; Carey, l. c. 538; Boott, Ill. i. 17, t. 47; Bailey, Proc. Am. Acad. xxii. 142, & in Gray, Man. ed. 6, 617; Macoun, l. c. 111; Britton, l. c. 340, fig. 816; Howe, l. c. 38; Holm, l. c. 207. *C. exilis*, var. *squamacea*, Dewey, l. c. fig. 54. *C. exilis*, var. *androgyna*, Dewey, in Wood, Class-book, ed.

1861, 750. — Bogs and meadows near the coast, or on the coastal plain, locally from LABRADOR and NEWFOUNDLAND, to NEW JERSEY: also summit of Smoky Mt., Cape Breton, NOVA SCOTIA; Crystal, MAINE; Bristol and Peacham, VERMONT; Essex and Onondaga Cos., NEW YORK; Mer Bleue, ONTARIO; Calumet, MICHIGAN; and reported from Hennepin and Crow Wing Cos., MINNESOTA. May–Aug.

* * Spikelets 2 to several, the staminate flowers mostly at their bases; plants very rarely dioecious.

— Perigynia broadest at the rounded or subcordate base; the beak rough or serrulate.

↔ Perigynia .40 to .50 as broad as long, the slender beak conspicuous, often nearly as long as the body: scales pointed.

26. *C. ECHINATA*, Murray. — Figs. 84 to 88. — *Culms rather wiry*, 1 to 4 dm. high: leaves shorter than or equalling the culms, 1 to 2.5 mm. wide: *spike linear-cylindric, 1 to 3 cm. long, of 2 to 6 subapproximate or slightly remote subglobose or oblong 3- to 12-flowered spikelets: perigynia finally yellowish, narrowly ovate, early ascending, later wide-spreading, faintly nerved or nerveless on the inner face, 3 to 4 mm. long, one-third or one-half exceeding the ovate pointed brownish scale.* — Prodr. 76; Boeckeler, *Linnaea*, xxxix. 124; Bailey, *Proc. Am. Acad.* xxii. 142; *Mem. Torr. Cl. i.* 57, & *Bull. Torr. Cl. xx.* 424; Macoun, *l. c.* 126; Richter, *Pl. Eur. i.* 150; Holm, *l. c.* 212. *C. muricata*, Huds. *Fl. Ang.* 406 (1778); Leers, *Fl. Herb.* 200, t. 14, fig. 8; not *L. C. Leersii*, Willd. *Prodr.* 28. *C. stellulata*, Gooden. *Trans. Linn. Soc. ii.* 144; Schkuhr, *Riedgr.* 45, t. C, fig. 14; Host, *Gram. i.* 41, t. 53; Schwein. & Torr. *l. c.* 317; Reich. *l. c.* *Fl. Germ.* viii. 9, t. 214, fig. 560; Carey in Gray, *Man.* 544; Boott, *Ill. i.* 55. *Vignea stellulata*, Reich. *Fl. Exc.* 57. *C. sterilis*, Gray, *Man.* ed. 5, 578; Bailey, *Bull. Torr. Cl. xx.* 424; Britton, *l. c.* 350, fig. 844; Howe, *l. c.* 38; not Willd. — Open low ground, LABRADOR and UNGAVA to ALASKA, south to Garrett Co., MARYLAND, OHIO, MICHIGAN, SASKATCHEWAN, and Humboldt Co., CALIFORNIA: also in EUROPE and ASIA. June–Aug. Extremely variable, passing by numerous transitions to the following more marked extremes.

Var. ormantha. — Fig. 89. — *Spikes 2 to 6 cm. long, of 2 to 4 very remote 3- to 9-flowered spikelets, the terminal one with a clavate base 0.5 to 1 cm. long: perigynia as in the species, spreading or slightly ascending, mostly twice as long as the scales.* — *C. echinata*, W. Boott, in Wats. *Bot. Cal. ii.* 237, in part. — RHODE ISLAND, Providence, 1846

(*Geo. Thurber*); CONNECTICUT, without locality (*Chas. Wright*); South-
ington, June 5, 1898 (*C. H. Bissell*); Waterford, May 29, 1889 (*C. B.*
Graves); OREGON, without locality, 1871 (*E. Hall*, no. 582); CALI-
FORNIA, bogs along Strawberry Creek, El Dorado Co., alt. 1,815 m.,
July 18, 1897 (*E. Brainerd*, no. 160 [type]); Big Trees, Calaveras
Co. (*Bolander*, no. 2324); Santa Rosa (*J. M. Bigelow*); Bluff Lake,
San Bernardino Mts., alt. 2,280 m., June, 1895 (*S. B. Parish*, no.
3702).

Var. *excelsior*. — Fig. 90, 91. — Tall and slender, 0.3 to 1 m.
high: spike 3 to 5.5 cm. long; spikelets 3 to 9, distinct, only the lower-
most remote, 12- to 20-flowered, at first oblong-cylindric, with the
perigynia ascending, later subglobose, with strongly reflexed perigynia
one-third longer than the scales. — *C. sterilis* β , Boott, Ill. i. 56, t.
146.* *C. sterilis*, var. *excelsior*, Bailey, Bull. Torr. Cl. xx. 424; Howe,
l. c. — NEWFOUNDLAND to MICHIGAN and NORTH CAROLINA.

Var. *CEPHALANTHA*, Bailey. — Figs. 92 to 94. — The coarsest form,
3 to 7 dm. high: leaves 2 to 4 mm. broad: spike cylindric or slightly
moniliform, 3 to 7.5 cm. long; the 4 to 8 broad-oblong spikelets approxi-
mate or slightly remote (rarely 1 cm. apart), 15- to 40-flowered:
perigynia ovate, one-half as broad as long, wide-spreading or reflexed. —
Mem. Torr. Cl. i. 58, & in Gray, Man. ed. 6, 618. *C. sterilis*, Boott,
Ill. i. 55, t. 146. *C. sterilis*, var. *cephalantha*, Bailey, Bull. Torr. Cl.
xx. 425; Britton, l. c.; Howe, l. c. 39. *C. sterilis*, var. *aequidistans*,
Peck in Howe, l. c. — NEWFOUNDLAND to NORTH CAROLINA, MICHIGAN,
and BRITISH COLUMBIA.

Var. *ANGUSTATA*, Bailey. — Figs. 95 to 97. — Extremely slender or
almost setaceous, 1 or 2 dm. high (in shade often taller): leaves 0.5 to
1.5 mm. wide: spike 0.75 to 2.5 cm. long; the 6 or fewer 3- to 15-flower-
ed spikelets approximate (or slightly remote in shade): the divaricate
perigynia lance-ovate or lanceolate, 2.5 to 3 mm. long, twice exceed-
ing the scales. — Mem. Torr. Cl. i. 59, & in Gray, Man. ed. 6, 618. *C.*
stellulata, var. *angustata*, Carey in Gray, Man. 544. *C. sterilis*, var.
angustata, Bailey, Bull. Torr. Cl. xx. 425; Howe, l. c. — NOVA SCOTIA
to CONNECTICUT, Lake St. John, QUEBEC, ILLINOIS, and MICHIGAN.

↔ ↔ Perigynia about .70 as broad as long, the beak short, one-fourth to
one-half as long as the body.

= Tall: leaves 2.5 to 4.5 mm. broad: perigynia 2 to 3 mm. broad: scales
sharp-pointed.

27. *C. STERILIS*, Willd. — Figs. 98 to 100. — Coarse, 1 m. or less
high: leaves flat, shorter than or equalling the culms: spike 1.5 to 3.5

cm. long; the 3 to 6 subglobose or oblong-cylindric densely 15- to 50-flowered olive-green spikelets crowded or distinct: the thick strongly many-nerved perigynia broad-ovate, 3 to 3.5 mm. long, squarrose or with recurved tips. — Sp. iv. 208; Schkuhr, Riedgr. Nacht. 3, t. Mmm, fig. 146. *C. stellulata*, var. *sterilis*, Carey in Gray, Man. 544. *C. stellulata*, var. *conferta*, Chapman, Fl. 534. *C. echinata*, var. *conferta*, Bailey, Carex Cat. 2, Proc. Am. Acad. xxii. 143, Mem. Torr. Cl. i. 58, & in Gray, Man. ed. 6, 618; Macoun, l. c. 126. *C. atlantica*, Bailey, Bull. Torr. Cl. xx. 425; Britton, l. c. 350. — Bogs and damp pine-barrens, near the coast from NEWFOUNDLAND to FLORIDA, rarely inland on cold bogs, at Lake St. John, QUEBEC (*G. G. Kennedy*); Squapan, Aroostook Co., and northern flank (near Bell Camp) of Mt. Katahdin, MAINE (*Fernald*); Adirondack Mts., Essex Co., NEW YORK (*Knieskern*); and Mt. Sorrow, Valley Forge, PENNSYLVANIA (*C. E. Smith*). June, July.

= = Low: leaves 0.5 to 2 (very rarely 2.5) mm. broad: scales blunt.

28. *C. INTERIOR*, Bailey. — Figs. 101 to 105. — Slender, 1.5 to 5 dm. high; the leaves 1 to 2 (rarely 2.5) mm. broad, shorter than or exceeding the rather stiff culms: spike 1 or 2 cm. long; the 2 to 5 spikelets all fertile, all sterile, or variously mixed, usually subglobose, 4 or 5 mm. in diameter, the terminal long-clavate at base, 5- to 15-flowered: perigynia firm, plump, olive-green or -brown, more or less nerved or almost nerveless, broadly deltoid-ovate, obscurely short-beaked and with slightly thickened margin, 2.3 to 3.2 mm. long, 1.5 to 2 mm. broad, finally wide-spreading or recurved, much exceeding the oblong or ovate blunt scales. — Bull. Torr. Cl. xx. 426; Britton, l. c. fig. 846; Howe, l. c. 39. *C. scirpoides*, Schkuhr, Riedgr. Nacht. 19, t. Zzz, fig. 180; Willd. Sp. iv. 237; Schwein. & Torr. l. c. 317; Dewey, Am. Jour. Sci. viii. 96; not *C. scirpoides*, Michx. *C. stellulata* γ, Torr. l. c. 392. *C. stellulata*, var. *scirpina*, Tuck. Enum. Meth., 9, not *C. scirpina*, Tuck. l. c. 8. *C. stellulata*, var. *scirpoides*, Carey in Gray, Man. 544; Boott, Ill. i. 56, t. 146.** *C. echinata*, Boeckeler, Linnaea, xxxix. 124, in part, not Murray. *C. norvegica*, E. P. Sheldon, Bull. Torr. Cl. xx. 284, & Minn. Bot. Studies, i. 224, not Wahl. In damp or wet soil, NEW BRUNSWICK to RUPERT LAND and VANCOUVER ISLAND, south to FLORIDA and ARIZONA. Commonest northward and in the interior. May-July.

Var. CAPILLACEA, Bailey. Stiff, culms almost setaceous; leaves about 0.5 mm. broad, often involute: perigynia strongly nerved. — Bull. Torr. Cl. xx. 426; Howe, l. c.; Britton, l. c. 351. — NEW HAMPSHIRE to NEW YORK, NEW JERSEY, and PENNSYLVANIA.

- + — Perigynia broadest near the middle, tapering to a narrow base and a smooth beak.

29. *C. SEORSA*, E. C. Howe. — Figs. 106 to 109. — *Culms soft*, in loose stools, 3.5 to 6.5 dm. high: *leaves shorter, soft, pale*, 2 to 4 mm. broad: *spikes 2.5 to 7 cm. long, of 2 to 6 mostly remote subglobose or oblong 6- to 20-flowered green spikelets 3.5 to 7 mm. long, the terminal one usually with a long-clavate base, the lower often subtended by a setiform bract: perigynia very thin and conspicuously nerved, elliptic-ovate, with a very short smooth beak and a narrow substipitate base, 2.7 mm. long, 1.9 mm. broad, wide-spreading or recurved, much exceeding the acutish scales.* — 48 Rep. N. Y. Mus. Nat. Hist. 40. *C. canescens*, var. *vulgaris*, Deane, Met. Park Fl. 95, not Bailey. — Wet woods and swamps, from Middlesex Co., MASSACHUSETTS to Suffolk and Oneida Cos., NEW YORK, south to DELAWARE. May, June.

Elongatae, Kunth. Spikelets remote or approximate in a simple elongated or short inflorescence. Staminate flowers at the base of the spikelets. *Perigynia ascending* when mature, glabrous, *ovate to oblong or lanceolate, plano-convex*, beaked or beakless, *not thin-winged*.

- * Perigynia more or less roughened or serrulate on the upper edges (sometimes smooth in exceptional forms of *C. canescens*; and by exception obscurely toothed in rare individuals of *C. tenuiflora*).

+ Perigynia broadest at the rounded or subcordate base.

30. *C. ARCTA*, Boott. — Figs. 110 to 113. — *Pale green* or somewhat glaucous: *culms very soft, in loose stools, 1.5 to 6 dm. high, often overtopped by the soft flat leaves 2.5 to 4 mm. broad: spike oblong-cylindric, of 5 to 13 ovoid or oblong closely approximate or slightly remote spikelets 6 to 11 mm. long: perigynia ovate, with a rather definite beak, strongly nerved on the outer, faintly on the inner face, 2 to 3 mm. long, 1.2 to 1.5 mm. broad, somewhat exceeding the acute, often brown-tinged, scales.* — Ill. iv. 155, t. 497; Macoun, l. c. 124; Britton, l. c. 352, fig. 850. *C. canescens*, var. *polystachya*, Boott in Richards. Arct. Exped. ii. 344; Bailey, Proc. Am. Acad. xxii. 144, Mem. Torr. Cl. i. 75, & in Gray, Man. ed. 6, 619. *C. Kunzei*, Olney, Proc. Am. Acad. viii. 406 (excl. syn.). *C. canescens*, var. *oregana*, Bailey, Mem. Torr. Cl. i. 75. — Wet woods, alluvial thickets and swales, from the larger river-valleys of MAINE and QUEBEC, Lake Champlain, VERMONT, and the Adirondack Mts., NEW YORK to Lake Nipigon, ONTARIO, and BRITISH COLUMBIA, south to MICHIGAN, MINNESOTA, and the coast and mountains of WASHINGTON and OREGON. June-Aug.

+ + Perigynia broadest near the middle.

++ Perigynia 2 to 3 mm. long, fully half as broad.

= Plant glaucous: spikelets oblong-cylindric to ovoid; the strongly appressed-ascending pale perigynia slightly roughened or smooth above, tapering gradually to the short obscure beak.

31. *C. CANESCENS*, L. — Figs. 114, 115. — Culms soft, in loose stools, 1.5 to 6 dm. high: leaves soft and flat, shorter than or exceeding the culms, 2 to 4 mm. broad: spike 2.5 to 5 cm. long, of 4 to 7 oblong-cylindric to narrowly obovoid appressed-ascending approximate or slightly remote spikelets 0.6 to 1 cm. long, the lowermost rarely 1.5 cm. apart: perigynia glaucous, ovoid-oblong, usually serrulate toward the short-pointed tip, 2.3 to 3 mm. long, 1.3 to 1.7 mm. broad, more or less nerved on both faces, somewhat exceeding the ovate pointed scale. Sp. ii. 974; Oeder, Fl. Dan. ii. 8, t. 285; Lightf. Fl. Scot. ii. 550; Reichb. Ic. Fl. Germ. viii. 7, t. 206, fig. 546; Anders. Cyp. Scand. 57, t. 4, fig. 39; Boott, Ill. iv. 154, in part; W. Boott ex Rothrock in Wheeler, Rep. 277; Ett. & Pok. Phys. Pl. Aust. vi. t. 515; Richter, Pl. Eu. i. 151. *C. brizoides*, Huds. Fl. Ang. 349, not L. *C. elongata*, Leers, Fl. Herb. 197, t. 14, fig. 7; Olney ex Wats. Bot. King Rep. 365; Bailey in Coulter, Man. Rocky Mt. Reg. 394, in part; not L. *C. cinerea*, Pollich, Pl. Palat. ii. 571. *C. Richardi*, Thuill. Fl. Par. (1799) 482. *C. curta*, Good. Trans. Linn. Soc. ii. 145; Host, Gram. i. 37, t. 48; Schkuhr, Handb. iii. 347, t. 287C, fig. 13; Eng. Bot. xx. t. 1386; Kunth, Enum. ii. 403. *C. lagopina*, Olney ex Wats. Bot. King Rep. 365, in part, not Wahl. *C. canescens*, var. *dubia*, Bailey, Bot. Gaz. ix. 119 & Proc. Am. Acad. xxii. 143. *C. canescens*, var. *robustina*, Macoun, l. c. 376. — Northern EUROPE. In wet places, seen from the following American stations — LABRADOR, (*Spreadborough* hb. Geol. Surv. Can. no. 13,372): RUPERT LAND, Lake Mistassini (*J. M. Macoun*, hb. Geol. Surv. Can. no. 30,511): MAINE, Fort Kent, Island Falls, and Foxcroft (*M. L. Fernald*, nos. 2143, 2144, 2145): NEW HAMPSHIRE, Mt. Washington and Mt. Lafayette (*E. & C. E. Faxon*); Crawfords (*E. F. Williams*): VERMONT, Ripton (*Ezra Brainerd*): ONTARIO, Belleville & Lake Nipigon (*J. Macoun*, hb. Geol. Surv. Can. nos. 30,513, & 30,512): MICHIGAN, Alma (*C. A. Davis*): COLORADO, Twin Lakes (*J. Wolff*, no. 1017); Bob Creek, alt. 3,230 m. (*Baker, Earle & Tracy*, no. 693): MONTANA, Grasshopper Valley (*S. Watson*, no. 435): WYOMING, without station (*Parry*, no. 278); Centennial Hills (*A. Nelson*, no. 1730); Beaver Lake (*A. & E. Nelson*, no. 6130):

UTAH, Bear River Cañon, alt. 3,080 m. (*S. Watson*, nos. 1231* & 1233); Alta, Wahsatch Mts., alt. 2,460 m. (*M. E. Jones*, no. 1273): ALASKA, Ounalaska (*J. M. Macoun*, hb. Geol. Surv. Can., no. 30,514); Sitka (*Mertens*): ALBERTA, Lake Louise (*E. Brainerd*): BRITISH COLUMBIA, Revelstoke (nos. 19 & 30,526), Comox (no. 371), Port Henry (no. 20,500), Mt. Mark, Vancouver Isl. (no. 30,515), Beaver Creek, Selkirk Mts. (no. 30,519), Dead Man River (no. 30,522), — *John Macoun*, hb. Geol. Surv. Can.; Ilgacho Brook (*Dawson*, hb. Geol. Surv. Can. no. 30,518); Lulu Island, Fraser River Delta (*R. B. Dixon*): WASHINGTON, upper valley of the Nesqually (*O. D. Allen*, no. 163). May–Aug.

Var. *SUBLIOLIACEA*, Laestad. — Figs. 116, 117. — Smaller, the short-oblong or subglobose *spikelets* 4 to 7 mm. long: *perigynia* smaller, barely 2 mm. long, smooth throughout. — Nov. Act. Soc. Sci. Ups. xi. 282; Andersson, Cyp. Scand. 57; Boott, l. c.; Bailey, Mem. Torr. Cl. i. 66; Richter, l. c. 152. *C. lapponica*, Lange, Linnaea, xxiv. 539. *C. canescens* in part, of Am. authors. — LAPLAND. In America specimens examined from UNGAVA, Ungava Bay (*L. M. Turner*): HUDSON BAY (*Sir John Richardson*): NEW BRUNSWICK, South Tobique Lakes (*G. U. Hay*, no. 55); Petitcodiac (*J. Brittain*, hb. Geol. Surv. Can. no. 30,510): NOVA SCOTIA, Halifax (*J. Macoun*): MAINE, Orono and Southport (*M. L. Fernald*): NEW HAMPSHIRE, Mt. Washington (*Asa Gray*, et al.); Mt. Monadnock — ledges toward summit (*W. P. Rich*): VERMONT, Willoughby Lake (*W. Boott*, *G. G. Kennedy*); summit of Mt. Mausfield (*E. Brainerd*); bog, Wallingford, alt. 675 m. (*E. Brainerd*): MASSACHUSETTS, Sharon (*W. P. Rich*); Washington, Berkshire Co. (*W. Boott*): NEW YORK, Fairfield (*A. Gray*); Pen Yan (*Sartwell*, no. 32); Oriskany Swamp (*Kniesken*); tamarack swamps, Herkimer Co. (*J. V. Haberer*): ONTARIO, Ottawa (*J. Fletcher*, hb. Geol. Surv. Can., no. 7408); Hastings Co. (*J. Macoun*): MICHIGAN, Flint (*D. Clark*); Lansing (*L. H. Bailey*, no. 262); Alma (*C. A. Davis*): BRITISH COLUMBIA, Mts. east of Adams Lake (*Dawson*, hb. Geol. Surv. Can., no. 30,520): WASHINGTON, Seattle (*C. V. Piper*, no. 1106).

Var. *disjuncta* — Figs. 118 to 120. — Tall and lax, 3 to 8 dm. high: *spike elongated, flexuous, 0.5 to 1.5 dm. long*; the 5 to 8 oblong-ovoid to cylindric *spikelets* 6 to 12 mm. long, all but the terminal remote, the lowermost 2 to 4 cm. apart: *perigynia* as in the species, serrulate above. — *C. canescens* of most Am. authors. *C. canescens*, form, Boott, Ill. iv. 154, t. 496. The common form in eastern America found in

most swamps or on wet shores from NEWFOUNDLAND to MICHIGAN, OHIO and PENNSYLVANIA. The following numbered specimens belong here — PRINCE EDWARD ISLAND, Brackley Point (*J. Macoun*, hb. Geol. Surv. Can. no. 30,509): NEW BRUNSWICK, Serpentine River (*Hay*, no. 84); Chipman (*Wetmore*, hb. Geol. Surv. Can. no. 30,507): NOVA SCOTIA, Boylston (*C. A. Hamilton*, hb. Geol. Surv. Can., no. 25,443); Baddeck (no. 20,805), Sable Island (nos. 22,076 & 23,071), Truro (no. 30,506) — *J. Macoun*, hb. Geol. Surv. Can.: MASSACHUSETTS: Framingham (*E. C. Smith*, no. 628): CONNECTICUT, Southington (*L. Andrews*, no. 590): ONTARIO, Cache Lake (*J. Macoun*, hb. Geol. Surv. Can., no. 22,036).

= = Green, not glaucous: spikelets subglobose to short-oblong, few-flowered: the loosely spreading dark green or brown perigynia serrulate at the base of the distinct beak.

32. *C. BRUNNESCENS*, Poir. — Figs. 121 to 124. — *Very slender and lax: culms 1.5 to 7 dm. high: leaves soft, flat, 1 to 2.5 mm. wide, shorter than or equalling the culms: spike 1 to 6 cm. long, of 3 to 6 more or less remote or approximate spikelets 3 to 7 mm. long: perigynia 2 to 2.7 mm. long, 1 to 1.5 mm. broad, with distinct slender beaks, loosely spreading when mature.* — Suppl. iii. 286; Britton, l. c. 351, fig. 848. *C. curta*, var. *brunnescens*, Pers. Syn. ii. 539. *C. canescens*, var. *alpicola*, Wahlenb. Fl. Lapp. 232; Bailey, Proc. Am. Acad. xxii. 143, & in Gray, Man. ed. 6, 618; Macoun, l. c. 124; Howe, l. c. 37. *C. Gebhardii*, Hoppe Car. Germ. 30. *Vignea Gebhardi*, Reichb. Fl. Exc. 58. *C. canescens*, β , Torr. Ann. Lyc. N. Y. iii. 393. *C. Persoonii*, Lange, Flora, xxv. (1842), 748; Reichb. Ic. Fl. Germ. viii. 7, t. 206, fig. 547. *C. canescens*, var. *sphaerostachya*, Tuck. Enum. Meth. 10, 19; Carey in Gray, Man. 544. *C. vitilis*, Fries, Mant. iii. 137; Anders. Cyp. Scand. 58, t. 4, fig. 38; Boott, Ill. iv. 219; Fl. Dan. xvii. t. 2973. *C. Buckleyi*, Dewey, Am. Jour. Sci. xlviii. 143, t. Dd, fig. 104. *C. sphaerostachya*, Dewey, l. c. xlix. 44, t. Ee, fig. 110. *C. canescens*, var. *vitilis*, Carey in Gray, Man. ed. 2, 514. *C. canescens*, var. *brunnescens*, Boott, l. c. 220 (*nomen nudum*); Bailey, Mem. Torr. Cl. v. 74. *C. canescens*, var. *vulgaris*, Bailey, Bot. Gaz. xiii. 86, Mem. Torr. Cl. i. 66, v. 74, & in Gray, Man. ed. 6, 618; Macoun, l. c. 123; Howe, l. c. 37. *C. brunnescens*, var. *gracilior*, Britton, l. c. 350. — Open woods and dry, rocky banks, NEWFOUNDLAND and LABRADOR to BRITISH COLUMBIA, south to IDAHO, MICHIGAN, and mostly in the mountains to NORTH CAROLINA. Also in GREENLAND and northern

EUROPE. June-Aug. On alpine summits becoming more rigid and browner than in sheltered situations.

↔ ↔ Perigynia 4 to 5.5 mm. long, distinctly less than half as broad.

= Leaves very narrow (1 to 2.5 mm. broad): spikelets lanceolate: perigynia 1 to 1.3 mm. wide.

33. *C. BROMOIDES*, Schkuhr. — Figs. 125, 126. — *Very slender and lax, green, scarcely glaucous*, the culms 3 to 8 dm. long, mostly exceeding the soft flat leaves: *spike loosely subcylindric*, 2 to 5.5 cm. long, of 2 to 6 approximate or slightly scattered spikelets 0.5 to 2 cm. long: beak of the *perigynium* one-half to two-thirds as long as the *strongly nerved* body, slightly exceeding the *oblong pointed scale*. — Riedgr. Nachtrag. 8, t. Xxx, fig. 176; Willd. Sp. iv. 258; Schwein. & Torr. Ann. Lyc. N. Y. i. 300; Torr. l. c. 391; Carey in Gray, Man. 539; Chapm. Fl. 533; Boott, l. c. ii. 82, t. 227; Bailey, Proc. Am. Acad. xxii. 146; Macoun, l. c. 114; Britton, l. c. 354, fig. 857; Howe, l. c. 47. — Rich low woods and swamps, NOVA SCOTIA, southern NEW BRUNSWICK and central MAINE to western ONTARIO and MICHIGAN, south to FLORIDA and LOUISIANA.¹ May-July.

= = Leaves broader (2 to 5 mm. broad): spikelets ovoid: perigynia 1.6 to 1.9 mm. wide.

34. *C. DEWETANA*, Schweinitz. — Figs. 127, 128. — *Very lax, glaucous*, the culms 2 to 12 dm. long, much exceeding the soft, flat leaves: *spike flexuous*, 2 to 6 cm. long, of 2 to 5 (in very luxuriant individuals rarely 6 or 7) 3- to 12-flowered spikelets 5 to 12 mm. long, the upper subapproximate or scattered, the lowest very remote, usually subtended by an elongate slender bract: beak about one-half as long as the *obscurely nerved or nerveless* body of the *perigynium*, somewhat exceeding the *ovate acuminate or short-cuspidate* pale scale. — Ann. Lyc. N. Y. i. 65; Dewey, Am. Jour. Sci. ix. 62, t. 3, fig. 11; Schwein. & Torr. l. c. 310; Torr. l. c. 392; Carey, l. c. 544; Boott, l. c. i. 27, t. 70; W. Boott in Wats. Bot. Calif. ii. 236; Bailey in Coulter, Man. Rocky Mt. Reg. 394, & Proc. Am. Acad. xxii. 146; Macoun, l. c. 124; Britton, l. c. fig. 856; Howe, l. c. 36. *C. remota*, Richards. in Frankl. 1st Journ. ed. 2, App. 35, acc. to Boott, not L. — Rich open woods and banks, NOVA SCOTIA and

¹ Californian and other northwestern specimens referred here seem much better placed with the stouter broader-leaved *C. Bolanderi*, Olney.

QUEBEC to ATHABASCA and BRITISH COLUMBIA, south to PENNSYLVANIA, MICHIGAN, NEW MEXICO, and WASHINGTON.¹ May-Aug.

* * Perigynia entirely smooth at the tip (exceptional forms of *C. canescens* might be looked for here; and very rare individuals of *C. tenuiflora* might be sought in the preceding section).

+ Perigynia oblong or ovate-oblong.

++ Perigynia 3 to 4 mm. long, nerved: culms weak, almost capillary: spikelets 2 to 4, loose, silvery-green or silvery-brown.

= Spikelets closely approximate in a small usually bractless terminal cluster: perigynia beakless.

35. *C. TENUIFLORA*, Wahlenb. — Figs. 129, 130. — Lax, the culms 2 to 6 dm. long, mostly exceeding the very narrow (0.7 to 2 mm. broad) pale green leaves: *spikelets subglobose, 3- to 10-flowered: perigynia 3 to 3.4 mm. long, 1.5 to 1.7 mm. broad*, with the bluntish scarcely beaked tip smooth or rarely with one or two teeth, about equalled by the ovate or ovate-oblong white scale. — Kongl. Vet. Acad. Handl. xxiv. 147, & Fl. Lapp. 232; Schkuhr, Riedgr. Nachtr. 17, t. Eeee, fig. 187; Anders. Cyp. Scand. 59, t. 4, fig. 36; Hook. Fl. Bor.-Am. ii. 214; Torr. l. c. 392, 443; Carey, l. c. 543; Boott, Ill. iv. 144, t. 463; Fl. Dan. Suppl. 13, t. 167; Bailey, Proc. Am. Acad. xxii. 145; Macoun, l. c. 122; Britton, l. c. 352, fig. 851 (as to habitual drawing); Howe, l. c. — Cold bogs among the mountains, SCANDINAVIA. Bogs and wet mossy woods, local, from eastern UNGAVA to western KEEWATIN and MANITOBA; south to Westmoreland and Victoria Cos., NEW BRUNSWICK; southern Aroostook, Penobscot and Oxford Cos., MAINE; Hampshire Co., MASSACHUSETTS; Oneida Co., NEW YORK; Ingham Co., MICHIGAN; Milwaukee Co., WISCONSIN; Chisago and Hennepin Cos., MINNESOTA: also on Elbow River, ALBERTA, and near Victoria, BRITISH COLUMBIA (*Macoun*, hb. Geol. Surv. Can. nos. 25,571 & 30,517).

¹ The California material which has been referred here is *C. Bolanderi*, Olney, differing in its less acutely angled culm, longer spikes of more approximate usually more numerous lance-cylindric many-flowered spikelets, the lowest with or without a short bract. The northwestern *C. Bolanderi*, var. *sparsiflora*, Olney (*C. Deweyana*, var. *sparsiflora*, Bailey) is a distinct species, probably *C. laeviculmis*, Meinshausen, Acta Hort. Petrop. xviii. 326, in its small short-beaked strongly nerved finally spreading thin-edged perigynia much nearer related to the eastern *C. scorsa* than to the members of the *Elongatae*.

= = Spikelets remote, the uppermost strongly divaricate-pedunculate; the lowermost subtended by a long leaf-like bract: perigynia beaked.

36. *C. TRISPERMA*, Dewey. — Figs. 131, 132. — Culms almost filiform, 2 to 7 dm. long, usually much overtopping the soft narrow (0.5 to 2 mm. wide) leaves: *the 2 or 3 spikelets, 2- to 5-flowered: the finely many-nerved perigynia 3.3 to 3.8 mm. long, 1.6 to 1.8 mm. broad, slightly exceeding the ovate-oblong pale obtuse to mucronate-acuminate scale.* — *Am. Jour. Sci.* ix. 63, t. 3, fig. 12; *Hook. Fl. Bor.-Am.* ii. 213; *Schwein. & Torr. l. c.* 311; *Carey, l. c.* 543; *Boott, l. c. i.* 29, t. 74; *Bailey, Proc. Am. Acad.* xxii. 144; *Macoun, l. c.* 122; *Britton, l. c.* 353, fig. 855; *Howe, l. c.* 35. — Mossy woods and bogs, NEWFOUNDLAND and LABRADOR to SASKATCHEWAN, south to northern PENNSYLVANIA, OHIO, MICHIGAN, and NEBRASKA (according to Webber), and in the mountains to Garrett Co., MARYLAND. Ascending to 770 m. in the New England mountains. June-Aug.

↔ ↔ Perigynia 1.2 to 1.5 mm. long, nerveless, with a very short broad truncate beak, or beakless: culms wiry: spikelets 3 to 5, closely flowered, in a greenish-brown or straw-colored linear spike.

37. *C. elachycarpa*. — Figs. 133, 134. — Tufted, the *stiff slender culms 3 or 4 dm. high, strongly scabrous above, longer than the soft narrow (1 to 2 mm. broad) green leaves: spike 0.5 to 1.5 cm. long; the appressed ascending narrowly ovoid approximate or slightly remote spikelets 3 to 6 mm. long: perigynia oblong, plump, smooth and nerveless, subtruncate at base, shorter than the oblong-ovate acuminate dull-brown, green-ribbed scales.* — MAINE, wet sandy river bank, Fort Fairfield, June 29, 1899 (*M. P. Cook, E. L. Shaw & M. L. Fernald*). A unique plant, in maturity strongly suggesting an immature slender form of *C. echinata*, or the little-known *C. helvola*, Blytt, which, however, have very different perigynia.

← ← Perigynia broadly elliptic to suborbicular: spikes mostly tinged with brown.

↔ Terminal spikelet with conspicuous clavate sterile base: perigynia rather abruptly contracted to the slender beak.

= Spikelets mostly distinct, the lowest 4 or 5 mm. thick.

38. *C. NORVEGICA*, WILLD. — Figs. 135, 136. — *Glaucous and freely stoloniferous; culms smooth and soft, 1 to 4.5 dm. high, mostly overtopping the soft flat rather narrow (1 to 2.5 mm. broad) leaves: spike*

1.5 to 5.5 cm. long, of 2 to 6 ovoid or broad-oblong spikelets; the lower 5 to 12 mm. long, the terminal, including the clavate sterile base, 1 to 1.8 cm. long: *perigynia* pale, faintly nerved, 2.5 to 3.3 mm. long, 1.6 to 2 mm. broad, *conic-rostrate*, usually abruptly contracted to a substipitate base, about equalled by the *yellowish brown orbicular to ovate blunt scales*. — Willd. ex. Schkuhr, Riedgr. 50, t. S, no. 66, & Spec. iv. 227; Wahlenb. Kongl. Vet. Acad. Handl. xxiv. 146, & Fl. Lapp. 233, t. 15, fig. 3; Anders. Cyp. Scand. 61, t. 4, fig. 29; Goodale in Holmes, Prelim. Rep. Nat. Hist. & Geol. Me. (1861), 128, & Proc. Portland Soc. Nat. Hist. i. 135; Gray, Man. ed. 3, Addend. xevii: Boott, l. c. iv. 214; Fl. Dan. Suppl. 13, t. 103; Bailey, Proc. Am. Acad. xxii. 145; Macoun, l. c. 125; Britton, l. c. 351, fig. 849 (as to habitual sketch). — Brackish marshes, northern SCANDINAVIA. Damp usually brackish soil, coast of southern LABRADOR: Anticosti Island, and Kamouraska, Saguenay, Rimouski, and Gaspé Cos., QUEBEC: locally southward along the coast in NEW BRUNSWICK at Shediac, Westmoreland Co., and Back Bay, Charlotte Co. (*J. Brittain*, herb. Geol. Surv. Can. nos. 30,421 & 30,420); Whale Cove, Grand Manan and Fries Island (*Hay*): NOVA SCOTIA, Baddeck, Cape Breton and Truro (*J. Macoun*, herb. Geol. Surv. Can. nos. 20,846 & 30,422); Boylston (*C. A. Hamilton*, herb. Geol. Surv. Can. no. 25,521): MAINE, Little Cranberry Isle (*Redfield*); Wells (*Blake*): reported from Alaska.¹ June-Aug.

= = Spikelets approximate at the tip of the culm, the lowest 2.5 to 4 mm. thick.

a. Plant weak and lax, with filiform or involute leaves.

39. *C. GLAREOSA*, Wahlenb. — Figs. 137, 138. — *Culms acutely angled, mostly curved*, scabrous at tip, 1 to 3 dm. high, once and a half or twice exceeding the *flaccid narrow (0.5 to 1.5 mm. broad) leaves*: spike oblong to obovoid, 0.7 to 2 cm. long, with 2 to 4 *appressed-ascending obovoid spikelets*; the lower 4 to 9 mm. long, 3 or 4 mm. thick, the terminal larger, including the slender sterile base, 6 to 11 mm. long: *perigynia* pale, elliptic or ovate, acute at base, with *narrowly conic beak*, faintly nerved or nerveless, 2.5 to 3 mm. long, 1.1 to 1.9 mm. broad, nearly or quite equalled by the *ferruginous white-edged ovate acutish scales*. — Kongl. Vet. Acad. Handl. xxiv. 146, & Fl. Lapp. 230; Willd.

¹ Prof. Conway MacMillan has courteously forwarded me the Minnesota specimens referred to *C. norvegica* by Mr. E. P. Sheldon (Bull. Torr. Cl. xx. 284, & Minn. Bot. Studies, i. 224), and they prove to be *C. interior*, Bailey.

Spec. iv. 251; Schkuhr, Riedgr. Nachtr. 24, t. Aaa, fig. 97; Anders. l. c. 62, t. 4, fig. 31; Torr. l. c. 396; Dewey, Am. Jour. Sci. Ser. 2, iv. 344; Boott, l. c. 153, t. 494; Fl. Dan. xiv. 8, t. 2430; Bailey, Proc. Am. Acad. xxii. 146; Macoun, l. c. 127; Britton, l. c. 353, fig. 854; Meinshausen, Acta Hort. Petrop. xviii. 325. — Arctic regions of both hemispheres, extending south in America along the coast of LABRADOR to QUEBEC, Bonne Esperance (*Allen*), Watsheeshoo (*St. Cyr*, hb. Geol. Surv. Can. no. 16,524), and Tadousac (*Kennedy*), Saguenay Co.; Pointe des Monts (*Bell*) and Grand Etang (*Macoun*, hb. Geol. Surv. Can. no. 30,413), Gaspé Co.: also on the coast of ALASKA. June-Aug.

b. Plant stiff and upright, with flat leaves.

40. *C. LAGOPINA*, Wahlenb. — Figs. 139, 140. — Culms *obtusely angled, mostly erect*, smooth except at tip, 1 to 4 dm. high, more or less exceeding the *narrow (1 to 3 mm. wide) leaves*: spike from cylindric to globose, 1 to 2.5 cm. long, with 3 to 6 ascending spikelets *mostly larger than in the last*: perigynia brown or reddish-brown, from elliptic-lanceolate to broadly obovate, *rather abruptly beaked*, 2.5 to 3.8 mm. long, 1.5 to 1.9 mm. wide, exceeding the *ovate obtuse white-margined fuscous scales*. — Kongl. Vet. Acad. Handl. xxiv. 145, & Fl. Lapp. 229; Gay, Ann. Sci. Nat. Ser. 2, xi. 177; Drejer, Rev. 25; Anders. l. c. 63, t. 4, fig. 28; Reichenb. l. c. t. 204, fig. 543; Torr. l. c. 393; Boott, Ill. iv. 189; W. Boott in Wats. Bot. Calif. ii. 233; Bailey in Coulter, Man. Rocky Mt. Reg. 395, & Proc. Am. Acad. xxii. 145; Britton, l. c. 353, (fig. uncharacteristic); Meinsh. l. c. *C. leporina*, L. Spec. 973, in part (cit. Fl. Lapp.); Oeder, Fl. Dan. ii. 9, t. 294; Willd. Spec. iv. 229; Schkuhr, Riedgr. Nachtr. 17, in part (excl. t. Fff, fig. 129); Host, Gram. iv. 45, t. 80; Eng. Bot. Supp. iii. t. 2815. *C. Lachenalii*, Schkuhr, Riedgr. 51, t. Y. fig. 79. *C. approximata*, Hoppe, ex DC. Fl. Fr. vi. 290. *C. parviflora*, Gaud. Etr. Fl. 84, acc. to Boott. *C. furva*, Webb, Iter Hisp. 5. — Arctic and alpine regions of EUROPE and ASIA: GREENLAND: ARCTIC AMERICA, rarely south to Mt. Albert, Gaspé Co., QUEBEC, the mountains of COLORADO, and northern CALIFORNIA. June-Aug.

→ → Terminal spikelet ovoid or subglobose, not conspicuously clavate at base: perigynia tapering gradually to the tip: culms sharply angled and harsh, upright, the 2 to 5 spikelets crowded at the tip: leaves flat.

41. *C. HELEONASTES*, Ehrh. — Figs. 141, 142. — Culms 1.5 to 3.5 cm. high, *stiff*, usually overtopping the *erect narrow (1 or 2 mm. wide)*

leaves: the globose or ovoid spikelets 4 to 8 mm. long: perigynia 2.5 to 3.5 mm. long, 1.2 to 1.7 mm. broad, brown tinged, mostly exceeding the ovate blunt scales. — Ehrh. in L. f. Suppl. 414; Wahlenb. Kongl. Vet. Acad. Handl. xxiv. 146, & Fl. Lapp. 230; Schkuhr, Riedgr. 51, t. II, fig. 97; Hoppe & Sturm, Car. Germ. t. 6; Hook. Fl. Bor.-Am. ii. 214; Reichenb. Ic. Fl. Germ. viii. t. 204, fig. 542; Anders. Cyp. Scand. 62, t. 4, fig. 30; Boott, Ill. iv. 152, t. 489; Fl. Dan. Suppl. t. 31; Bailey, Proc. Am. Acad. xxii. 145; Macoun, l. c. 127; Britton, l. c. 352, fig. 852. *C. leporina*, Schkuhr, Riedgr. Nacht. t. Fff, fig. 129, not L. *C. Carltonia*, Dewey, Am. Jour. Sci. xxvii. 238, t. U. fig. 64; Torr. l. c. 393. *C. marina*, Dewey, l. c. xxix. 247, t. X, fig. 74; Torr. l. c. — Bogs and mossy places, arctic and alpine EUROPE. Very locally in America: examined from the following stations: — KEEWATIN, York Factory (Sir John Richardson): SASKATCHEWAN, Norway House and Carlton House (Richardson): ALBERTA, Lake Louise (Ezra Brainerd, no. 172): BRITISH COLUMBIA, Glacier (Ezra Brainerd); Kicking Horse Lake (J. Macoun, hb. Geol. Surv. Can. nos. 28; 49; 30,410; 30,411; 30,412). July, Aug.

II. — THE VARIATIONS OF SOME BOREAL CARICES.

CAREX AQUATILIS.

C. AQUATILIS, Wahlenb., Kongl. Acad. Handl. xxiv. 165. — Plants 3 to 9 dm. high; leaves 4 to 7 mm. broad: spikelets¹ slender; the pistillate 1.5 to 5.5 cm. long, 3 to 4.5 mm. thick, the lowermost often long-attenuated and remotely flowered at base: scales dark, subacute, hardly equaling or barely exceeding the perigynia. — Northern EUROPE, GREENLAND. In North America from the Shickshock Mts., Gaspé, QUEBEC,

¹ The inflorescences of *Carex* are simple or compound spikes, racemes, or panicles; and, since in other genera of *Cyperaceae*, as *Cyperus* and *Scirpus*, the ultimate spicate divisions of the inflorescence are called *spikelets*, that term is here adopted, for the sake of uniformity and clearness, for these ultimate spicate divisions of the inflorescence of *Carex*. The species in which there is a solitary simple inflorescence (or true spike), as *C. gynocrates* and *C. exilis*, are few in comparison with those in which the inflorescence has more than one such division. From the occurrence in those plants, however, of occasional secondary divisions of the inflorescence, the term *spikelet* seems not inappropriate to the normal inflorescence of such species.

to Bear Lake, MACKENZIE & BRITISH COLUMBIA, south to MAINE, VERMONT, central and western NEW YORK, and UTAH. The Scandinavian material examined has been referred to the true *C. aquatilis* by Andersson, Fries, Laestadius, and Wickström, and it agrees well with Lange's representation of the plant in Flora Danica, Supplement, t. 33. This is the plant of broadest range in America. Many extreme variations have been described by European authors. The identity of these is too often obscure, but some of the forms recognized by Mr. Arthur Bennett in Great Britain (Jour. Bot. xxxv. 248) are found to occur also in America. As extreme variations these plants may well be distinguished, though many transitional specimens occur which render their ready separation difficult. The best marked forms are the following:

Var. ELATIOR, Bab. Man. Brit. Bot. 341; Bennett, l. c. 249. — Robust, 0.9 to 1.5 m. high: leaves 5 to 8 mm. broad: pistillate spikelets stout and heavy, 3.5 to 8 cm. long, 5 to 8 mm. thick: scales dark, blunt or acuminate, about equalling or slightly exceeding the perigynia. — MAINE, Fort Fairfield and Orono (*M. L. Fernald*, nos. 136, in part, 395): NEW YORK, Pen Yan & Junius (*Sartwell*); Dexter (*G. Vasey*); Jefferson Co. (*Crawe*); Niagara Falls (*W. Boott*): OHIO (*Sullivan*): MICHIGAN, Pêche Isle, Detroit River (*C. F. Wheeler*): MANITOBA, English River (*Sir John Richardson*).¹ I have been unable to see authentic specimens of Babington's plant, but from his description and the note of Mr. Bennett, it seems probable that our large form should be referred there. The material from Orono (where the once abundant plant has been exterminated by the "improvement" of the meadow) has been described as a hybrid, *C. aquatilis* \times *stricta*, Bailey, Bot. Gaz. xvii. 153; but there was little besides the local occurrence of the plant to suggest hybrid origin. The same very large form is shown in Crawe's New York material, as well as in Richardson's English River plant, and it is closely matched by Boott's plate 542, drawn from New York specimens.

¹ Richardson's plant probably came from the river rising in Lake Sal and flowing into Lake Winnipeg from the southeast. The name *English River* has been applied to a district between the Saskatchewan and Athabasca Lake, and it was long used for the upper portion of Churchill River (emptying into Hudson Bay). This larger northern river, however, was consistently spoken of by Richardson in his Arctic Searching Expedition (1852), p. 62, &c., as Mississippi or Churchill River, while to the more southern river flowing from Lake Sal he applied the name English River (p. 362).

Var. *VIRESCENS*, Anders. Cyp. Scand. 46; Bennett, l. c. — Scales pale and short, mostly hidden by the closely imbricated perigynia, thus giving the spikelets a pale green color. — Northern EUROPE. The only American specimens seen are from MICHIGAN, without locality (*Michigan State Collection* in herb. Gray); near Alma (*C. A. Davis*). Material from Pownal, VERMONT, closely approaches this variety, but has longer darker scales.

Var. *CUSPIDATA*, Laest. ex Fries, Bot. Not. (1843) 104; Bennett, l. c. — Spikelets slender, 3 or 4 mm. thick: scales cuspidate, distinctly exceeding the perigynia. — Northern EUROPE. QUEBEC, Grand Etang, Gaspé (*J. Macoun*): NEW JERSEY, Camden (*C. F. Parker*). The Gaspé plant is a perfect match for Lapland material from Nylander, but the New Jersey specimen shows a nearer approach to typical *C. aquatilis*.

Var. *EPIGEJOS*, Laest. Kongl. Vet. Akad. Handl. (1822) 339; Bennett, l. c. — Very slender: the leaves 2 to 3.5 mm. broad: spikelets at most 5 cm. long, 2 to 4.5 mm. thick; scales dark and blunt. — Northern EUROPE, GREENLAND. NEWFOUNDLAND (*La Pylaie*); Packs Harbor (*A. C. Wagborne*, no. 35): LABRADOR, L'Anse au Loup (*J. A. Allen*): QUEBEC, Mont Louis, Cape Rosier, and Madaline River, Gaspé (*J. Macoun*, nos. 23, 27, 31). The material examined matches well Scandinavian material from Ahlberg. It is also identical with plants from Lapland distributed by Andersson as var. *sphagnophila*. The latter variety, however, is said by Andersson to differ from var. *epigejos* in its pale not dark scales.

CAREX PILULIFERA and C. COMMUNIS.

Carex pilulifera, L., a common species of Europe, presents three rather marked tendencies. The original plant of Linnaeus was apparently the common form with the pistillate spikelets subapproximate or slightly remote at the tip of the somewhat curved culm. This form with the lower spikelets sometimes 1 cm. apart, is represented in the Gray Herbarium by specimens from many parts of northern and central Europe. In this plant the perigynium is 2.5 to 3.5 mm. long, tipped by a short bidentate beak less than 1 mm. in length. Another phase of the plant, evidently rare in Europe, has larger more scattered spikelets, the lower often subtended by a conspicuous leafy bract; and the larger perigynia more ellipsoid or with the longer beak equalling the stipitate spongy basal portion and thus giving the perigynia a symmetrical spindle-

form. This larger plant was described by Lange as var. *longibracteata* and later figured by him in *Flora Danica*, xvii. t. 3050; and again it has been described by Ridley and figured in *Jour. Bot.* xix. 97, t. 218, as var. *Leesii*. A third European form, var. *pallida*, Peterm., as shown by Reichb. *Ic. Fl. Germ.* viii. 26, t. 240, has the densely flowered spikelets closely approximate in an ovoid or subglobose head.

In studying this European species in connection with the well known American plant which has recently been called *C. communis*, Bailey, the writer has been baffled in every attempt to find constant distinguishing characters to separate the plants of the two continents. The form of the plant most common perhaps in America is apparently rare in Europe (var. *longibracteata*, Lange; var. *Leesii*, Ridley), but it passes by absolutely promiscuous variations into a small form which can be distinguished in none of its characters from the smaller tendency of the European *C. pilulifera*.

By early caricologists the American plant was supposed to be *Carex varia*, Muhl., and under that name it passed until in 1889 Professor Bailey showed that Muhlenberg's plant was the more slender species described by Dewey as *C. Emmonsii*. In place of the misapplied name, *C. varia*, Professor Bailey proposed for the plant which had long borne that name the new appellation *C. communis*, giving no suggestion that the plant has close affinity to the common *C. pilulifera* of Europe. To earlier students, however, the separation of the American and European plants of this group had presented many perplexities. Drejer stated in his *Revisio* that he could find no distinctions either in the descriptions or specimens: "Forsitan nostra planta rectius cum *C. varia* Mühlenb. conjungitur; quo modo autem *C. variam* a *C. pilulifera* distinguam, neque ex descriptione neque ex speciminibus eruere possum."¹ Schlechtendahl discussing specimens in the Willdenow herbarium which he took for *C. varia* was unable to point out any character to separate it from *C. pilulifera*: "Species haec vero simillima *C. piluliferae* et uti nobis fere videtur eadem."² Whether Drejer and Schlechtendahl had true *C. varia* of Muhlenberg or the coarser plant which so long passed under that name is not perfectly clear, although it is probable that Schlechtendahl at least had the true *C. varia*.³ This plant, the true *C. varia* (*C. Emmonsii*, Dewey) is readily distinguished from *C. pilulifera* by its much more slender habit, very narrow leaves and smaller-bodied longer-beaked perigynia.

¹ Drejer, *Rev. Crit.*, 55.

² Linnaea, X. 262.

³ See Bailey, *Mem. Torr. Club.*, I. 40.

The coarse American plant, *C. communis*, Bailey, which until recently passed as *C. varia*, presents, however, less definite marks of specific distinctness. The most careful analysis of the characters which are supposed to separate *C. communis* (*C. varia* of authors) from *C. pilulifera* was published by Francis Boott, who inclined to regard the two species as separable. In his discussion of *C. pilulifera*, Boott said: "A *C. varia*, Muhl. [*C. communis*, Bailey], differt spicis confertis, plurifloris, subinde apice masculis, e viridi-purpureo variegatis; perigyniis enerviis, rostello semper recto brevior bidentato; basi styli persistente abrupte compresso-deflexa; culmo incurvo, basi vaginis foliorum pallide ferrugineis tecto; foliis viridibus."¹ In discussing *C. varia* [*C. communis*, Bailey] he said: "A *C. pilulifera* differt inflorescentia laxa; spicis plus minus remotis, laxifloris, saepe paucifloris; perigyniis subinde nervatis, rostro nunc excurvato, bifido; basi styli persistente recta; vaginis foliorum purpureis."²

When we analyze these supposed differences in the light of old specimens and the abundant modern ones which have accumulated since the publication of Dr. Boott's work, certain traditional marks of separation fail. The large form of the American plant figured by Boott (t. 288) as *C. varia*, and treated by Bailey as *C. communis* and by Britton as *C. pedicellata*, has the spikelets more remote than in the common European form of *C. pilulifera*; but a comparison of this plate with Lange's illustration of his *C. pilulifera*, var. *longibracteata* (Fl. Dan. xvii. t. 3050) and the figure of *C. pilulifera*, var. *Leesii* (Jour. Bot. xix. t. 218), shows that the rarest form of the European plant is not to be distinguished by the crowding of the spikelets from our larger form of *C. communis*. If, furthermore, we compare Boott's *C. varia*, var. *minor* (t. 289), a common plant in America, with the smaller European specimens of *C. pilulifera* with slightly remote spikelets, no constant difference can be found to separate them. The plant in America passes by innumerable transitions to the coarsest form (var. *longibracteata*), as shown in the large middle specimen in Boott's t. 289, but in its extreme form, as shown by the smaller specimens in that plate, the spikelets are often subapproximate. A comparison of this plate as well as scores of American specimens such as Eggleston's no. 434 from Middlebury, Vermont; Brainerd's material from Mt. Mosalamoo, Vermont; no. 4897b of the Biltmore Exsiccatae from Craggy Mt., North Carolina; Bailey's material of June 13, 1888, from West Harrisville, Michigan, and his no. 187 from Lansing;

¹ Ill., II. 96.² Ibid. 98.

Wheeler's specimens from Grand Ledge, Michigan; Macoun's 1876 material from Quesnelie, British Columbia, with specimens of *C. pilulifera* from Berne, Switzerland (*Seringe*); Stockholm, Sweden (*Andersson*); Finland (*Simming*); the Grosser Pfalzberg, Austria (*Halácsy*, no. 1064), and St. Petersburg, Russia (*Turczaninow*); shows conclusively that the remoteness of the spikelets is not to be relied upon in separating our smaller American material from the European plant. In the accompanying tabulation of measurements from European specimens and the smaller form of the American plant it will be seen that in the length of the inflorescence and the number, length and remoteness of spikelets essentially identical conditions are found, although the European material shows a tendency to a reduction in the length of the rachis between spikelets, thus passing to the short-headed var. *pallida*, while the American plant varying toward the elongated variety *longibracteata* shows a natural lengthening of the rachis.

Dr. Boott laid stress upon the more abundantly flowered spikelets of *C. pilulifera*, but an examination of the European material shows that this character is maintained only in the extreme specimens with unusually full spikelets. In the others many spikelets are found bearing less than ten flowers while not a few have only four or five. The presence or absence, in the American or the European plant, of staminate flowers at the tips of the pistillate spikelets is likewise a character upon which little reliance can be placed. Both Goodenough¹ and Dr. Boott² noted this tendency in European specimens and in a sheet of Austrian material it is very conspicuous. In America likewise this tendency to androgynous spikelets occurs, but it seems to be quite as unusual as in Europe.

The pale or castaneous scales of *Carex communis* were emphasized by Dr. Boott as opposed to the purple scales of *C. pilulifera*. Students of American Carices, however, are all familiar with specimens of *C. communis* from sunny or open situations in which the scales are quite as purple (or rather maroon) as in *C. pennsylvanica*; and many specimens of European *C. pilulifera* show quite as little color in the scales as do the commoner plants of America.

The basal nerves supposed to distinguish the perigynium of *C. communis* from that of *C. pilulifera* are also quite as often wanting as present; and although Dr. Boott laid stress upon this character in his comparative note, he described the perigynia of *C. communis* (his *C. varia*) as "enerviis vel basi plus minus nervatis pallidis." The length,

¹ Trans. Linn. Soc., II. 191.

² Ill., II. 96.

TABLE OF MEASUREMENTS OF EUROPEAN *Carex pilulifera* AND THE SMALLER FORM OF AMERICAN *C. communis*.

European Specimen.	Collector.	Length of Inflorescence in mm.	Length of staminate Spikelet in mm.	Number of staminate Spikelets.	Length of pistillate Spikelet in mm.	Distance in mm. between lowest Spikelets.	Length of Perigynia in mm.	Length of Beak in mm.
Strömbacka, Sweden . .	Laurén	12-18	6-8	2-3	4.5-6	4.5-7	3.4	0.6
Finland	Simming	16-19	6-7	3-4	4	8	2.8	0.8
Stockholm, Sweden . .	Andersson	17-22	10-11	2-3	7	5-7	2.7	0.7
Halifax, England . . .	Leyland	18-22	7-10	2-3	5.5	5-10	3.0	0.7
Dresden, Germany . . .		20	9-13	3	4-6	7.5	2.9	0.7
Halle, Germany	A. Schulz	18-23	8-9	4	4-8.5	9	3.0	0.8
Berne, Switzerland . .	Seringe, no. 1238	17-22	10	2-3	4.5-7	3.5-7	3.0	0.8
Upsala, Sweden	Angström	14-26	9-16	2-4	5-9	3-9	2.8	0.7
Kyffhauser (Mt.), Germ'ny		17-22	11	3	6-8	6	3.0	0.7
Grosser Pfalzberg, Austria	Halácsy, no. 1064	14-26	7-18	1-3	3-6	3.5-6.5	2.7	0.9
Salzburg, Austria . . .	Hoppe	26-32	11-13	4-5	6-11	6-9	3.0	0.7
St. Petersburg, Russia .	Turczaninow	18-23	9-11	2	5-7	6-9	2.9	0.7
Upsala, Sweden	Tuckerman	25	10	4	6-8	9	3.0	0.8
Snowdon, Wales	J. Ball	18	6.5	3	6	6	2.9	0.8
Extremes in Europe . .		12-32	6-18	1-5	3-11	3-10	2.7-3.4	0.6-0.9
American Specimen.								
Keweenaw Co., Mich. . .	Farwell, no. 653	10-13	4	2-3	4	5-6	3.3	0.8
Alcona Co., Mich. . . .	Bailey	15-19	4-8	2	5-7	7-15	3.2	0.8
Burlington, Vt.	Jones & Eggleston	11-23	6-13	1-2	6-8.5	7-8	3.2	0.8
Quesnelle, Brit. Columbia	Macoun	15-23	9-10	2-3	5-6	5-10	3.0	0.7
Grand Ledge, Mich. . . .	Wheeler	18-19	8	3	5-6	6-9	3.3	0.8
Mt. Mosalamoo, Vt. . . .	Brainerd	17-23	8	3	4-6	7-12	2.4	0.8
East Mt., Middlebury, Vt.	Eggleston, no. 434	17-24	9-11	2-3	5-6.5	5-13	2.6	0.9
Willoughby Mt., Vt. . .	Faxon	13-26	6.5-10	1-2	4-6	8-12	3.0	0.7
Lake Memphremagog, Q'b.	Faxon	13-29	3.5-9.5	2-4	4-8.5	7-11	3.0	0.9
Craggy Mt., No. Carolina	Biltmore Herb., no. 4897 ^b	21-31	9-16	2-3	4-8	7-11	2.8	0.7
Orono, Me.	Fernald	23-36	6-13	3-4	4-9	11-12	3.1	1.0
Franconia, N. H.	Faxon	24-39	8-11	3-4	4-9	7-15	3.3	0.8
Milwaukee, Wis.	Lapham	30-35	14	3	4-7	9	3.0	0.9
Lansing, Mich.	Bailey, no. 187	25-39	13-18	2	4-8	11-14	3.2	0.8
Extremes in America . .		10-39	3.5-18	1-4	4-9	5-15	2.4-3.3	0.7-1.0

bending, and orifice of the beak show likewise considerable variation in Old World specimens, all of which can be matched by our plant, while the curving of the base of the style is a tendency not infrequent in American as well as European specimens. On the other hand, the straight style supposed to characterize the American plant is clearly represented by Lange in his plate of *C. pilulifera*, var. *longibracteata*.

The deeper purple coloring of the lower sheaths of the American plant, a character much emphasized by authors, is not a satisfactory distinction. The color in the American plant is usually conspicuous and is pronounced by Mr. F. Schuyler Mathews a dilute maroon with no true purple tendency, but rather fading in the older sheaths to chestnut. Mr. Mathews, who has likewise examined the sheaths of European specimens, finds the same red present in them. This color of the sheaths generally fades with age, yet in specimens collected by John Ball on Snowdon, by Andersson at Stockholm in 1860, by Laurén at Strömbacka in 1855, and by Tuckerman at Upsala in 1841 or 1842, show quite as conspicuous a red as the average American plant.

The bright green color of the leaves of *C. pilulifera* has likewise been maintained as a character separating that plant from the American *C. communis*. From dried specimens alone it is impossible to make this distinction apparent, although the fresh plant may sometimes show a brighter color than is often seen in *C. communis*. Yet in the American plant the leaves vary from a weak to a deep green, and in Bailey's var. *Wheeleri*, which is certainly inseparable from European specimens of *C. pilulifera*, the leaves were originally described as "bright green."

The length of the staminate spikelet and the breadth of the leaves, two characters upon which stress is sometimes laid, were not emphasized by Dr. Boott. An examination of the accompanying table of measurements of the inflorescence will show that the length of the staminate spikelets is thoroughly inconstant and not concomitant with other characters. In fact, both short and long staminate spikelets are often found on the same individual, as shown by Halácsy's no. 1064 of the Austro-Hungarian Exsiccatae (staminate spikelets from 7 to 18 mm. long), by Fernald's no. 151 from Maine (spikelets 6 to 13 mm. long), and a Faxon plant from Franconia, New Hampshire (spikelets from 8 to 14 mm. long). The variations in the breadth of the leaf, likewise, are very great on both continents. The young leaves at the fruiting season are naturally much narrower than the old and weather-beaten ones, which, unfortunately, are too often torn away in the preparation of attractive specimens. Measurement of the breadth of these older leaves

where present shows in the American plant a variation from 2 to 5.5 mm. and in the European from 2 to 4.5 mm. These measurements, however, include the largest American form, in which all the parts are conspicuously more developed than in the smaller American and the apparently identical European plant.

The length of the lower bract, emphasized in the descriptions of *C. pilulifera*, var. *longibracteata* and var. *Leesii*, seems to the writer an unfortunate character to make prominent. In America, at least, this elongation of the bract accompanies no other definable character. It is a purely vegetative development which may occur either in the large form (*C. varia* [typical] of Boott's Ill. t. 288) or in the smaller *C. communis*, var. *Wheeleri* with shorter inflorescence and more approximate spikelets.

This study of the European *Carex pilulifera* and the American *C. communis* (*C. varia* of many authors) has led to the following conclusions. The form of *C. pilulifera* of Europe with the pistillate spikelets subapproximate or slightly remote, the lowest from 0.5 to 1 cm. apart, is also common in America, where the plant has passed generally as *C. varia*, var. *minor*, Boott; *C. communis*, Bailey, and *C. pedicellata*, Britton, in part; or *C. communis*, var. *Wheeleri*, Bailey (*C. pedicellata*, var. *Wheeleri*, Britton). Another European form, the large *C. pilulifera*, var. *longibracteata*, Lange, is rare in Europe, but in America is represented by the large extreme which has passed as *C. varia* and later as *C. communis* and *C. pedicellata*. The American plants, then, should be called

C. PILULIFERA, L. Culms 1 to 5 dm. high, usually overtopping the leaves: inflorescence 1 to 3.5 cm. long, the lowest spikelet subtended by a short and narrow or sometimes elongated broad bract: staminate spikelet from green to chestnut-brown or maroon, sessile or stalked, 3.5 to 20 mm. long; pistillate spikelets 1 to 5, loosely flowered, 4 to 11 mm. long, sessile or short-pedicelled, subapproximate or slightly remote, the lowest rarely 1.5 cm. apart: perigynia hairy, obscurely 3-angled, 2.5 to 3.5 mm. long, the body plump, obovoid or subglobose, with a more or less elongated spongy nerveless or slightly nerved stipitate base; the beak broad, bidentate, rarely 1 mm. long, nearly or quite equalled by the green brown or reddish-brown ovate acuminate scale. — Sp. 976; Gooden. Trans. Linn. Soc. ii. 190; Schk. Riedgr. 78, t. I, fig. 39; Andersson, Cyp. Scand. 30, t. 7, fig. 82; Reichb. Ic. Fl. Germ. viii. t. 260; Boott, Ill. ii. 96, t. 283. *C. filiformis*, Pol. Pl. Palat. ii. 581; Vahl, Fl. Dan. vi. t. 1048; not L. *C. Bastardi-*

ana, DC. Fl. Fr. vi. 293. *C. varia*, Authors, incl. Boott, Ill. l. c. 97, in part, not Muhl. *C. varia*, var. *pedicellata*, Dewey, Am. Jour. Sci. xi. 163, in part. *C. varia*, var. *minor*, Boott, l. c. t. 289. *C. communis*, in part, and var. *Wheeleri*, Bailey, Mem. Torr. Cl. i. 41. *C. pedicellata*, in part, and var. *Wheeleri*, Britton, Mem. Torr. Cl. v. 87, 88. — In dry soil, NEW BRUNSWICK to BRITISH COLUMBIA, NORTH CAROLINA, OHIO and WISCONSIN: common in EUROPE. Passing gradually to

Var. LONGIBRACTEATA, Lange. Coarser; the inflorescence often 5 to 8 cm. long, the usually fuller and longer pistillate spikelets remote, the lowest 1.5 to 4 cm. apart: perigynia larger, more ellipsoid or spindle-form, with longer beak. — Haandb. Dansk. Fl. 621, & Fl. Dan. xvii. 12, t. 3050; Kneucker, Allgem. Bot. Zeitschr. (1898) 128. *C. varia*, Authors, in part, incl. Boott, l. c. t. 288, not Muhl. *C. varia*, var. *pedicellata*, Dewey, l. c., in part. *C. saxumbra*, F. A. Lees, Jour. Bot. xix. 25. *C. pilulifera*, var. *Leesii*, Ridley, Jour. Bot. xix. 98, t. 218. *C. communis*, Bailey, l. c. in part. *C. pedicellata*, Britton, l. c. in part. — NEW BRUNSWICK to IOWA and GEORGIA: rare and local in northern EUROPE.

CAREX PENNSYLVANICA.

Carex pennsylvanica, Lam., is one of the widest-distributed of the North American Carices, and as one of the earliest-flowering it is perhaps better known to the general botanist than any of the other species. In the length and breadth of its leaves, the comparative height of its culm, etc., the plant shows considerable variation, and many formal varieties have been based upon these characters. But since they are all of a purely vegetative nature, often produced in a colony of the species by changes of ecological conditions, none of these variations seem to the writer of sufficient constancy to merit recognition as more than trivial forms. The color of the spikelets, also, a character too commonly relied upon to separate *C. pennsylvanica* from the closely related *C. pilulifera*, L. (*C. communis*, Bailey), is not to be accepted as final, since *C. pennsylvanica*, ordinarily characterized by dark reddish brown scales, may often have them pale or even straw-colored when growing in deep shade. Furthermore, *C. pilulifera* in northern Europe as well as in America is frequently found with dark red scales, especially when growing in very sunny or exposed situations. The simplest means of distinguishing *C. pennsylvanica* from its nearest common ally is in its stoloniferous character; for when well developed the plant produces

conspicuous elongated stolons, while *C. pilulifera* (*C. communis*) is caespitose, with short assurgent basal shoots. As may be implied, varieties of *C. pennsylvanica* based upon color of the spikelets are quite as inconstant as are those based upon the length or breadth of the leaf, or other purely vegetative tendencies. In the character of its perigynia, however, *C. pennsylvanica* presents three marked variations which, from the material examined, seem to belong to well marked geographic areas. These forms of the plant are:

C. PENNSYLVANICA, Lam. Dict. iii. 388. Strongly stoloniferous; the slightly caespitose small stools with reddish bases: leaves soft, comparatively narrow, 1.5 to 3.5 mm. broad, 0.5 to 5 dm. long, shorter than, equalling, or often exceeding the slender culms: pistillate spikelets 1 to 4, globose or ovoid, loosely flowered, approximate or more or less remote, the lowest rarely peduncled, often subtended by a narrow leafy bract: scales usually maroon or red-tinged, rarely pale: perigynia from subglobose to obovoid, puberulent, the short bifid beak one-fourth to one-fifth as long as the body: staminate spikelet clavate, 1 to 2 cm. long, sessile or short-stalked, usually reddish, rarely straw-colored. — In dry or sandy soil from Cumberland Co., MAINE, to ALBERTA, south to GEORGIA and NEW MEXICO. It is impossible to say from the original description whether this or the following variety was intended by Lamarck, but the commonest form of the species has been accepted as typical since it was so considered by Boott, Kunze, and other classic writers on the genus. The varieties and forms described by Peck (46 Rep. N. Y. Mus. Nat. Hist. 51; 48 Rep. 76) appear to be vegetative states due largely to different degrees of light and exposure.

Var. *lucorum*. Perigynium puberulent or glabrate, with a conspicuous slender beak nearly or quite as long as the body. — *C. lucorum*, Willd. Enum. Pl. Berol. Suppl. 63; Kunze, Car. 153, t. 39; Boott, Ill. ii. 98, t. 291, in part. — MAINE to MICHIGAN and "ARCTIC AMERICA," and in the mountains to NORTH CAROLINA. MAINE, Orono, May 31, 1890, June 4, 1898 (no. 2006) — *M. L. Fernald*; Cambridge (*F. S. Bunker*); Glassface Mt., Rumford, July 13, 1890 (*J. C. Parlin*); NEW HAMPSHIRE, Barrett Mt., New Ipswich, June 5, 1896 (*M. L. Fernald*); VERMONT, Chipman Hill, Middlebury, May 30, 1897, Burlington, June 16, 1898 (*E. Brainerd*); Pownal, May 29, 1898 (*J. R. Churchill*); MASSACHUSETTS, Spot Pond, Stoneham, May 29, 1855, Malden, June 11, 1861, Medford, May 21, 1865, Blue Hills, Milton, June 3, 1870 (*Wm. Boott*); Purgatory Swamp, Dedham, May 26, 1878 (*E. & C. E. Faxon*); Wilmington, May 14, 1899 (*E. F. Williams*):

RHODE ISLAND, Cumberland (*S. T. Olney*): CONNECTICUT, Southington, June 4, 1899 (*C. H. Bissell*); Fairfield, June 23, 1901 (*E. H. Eames*, no. 168): MICHIGAN, Detroit, May 22, 1864, June, 1860, May 9, 1858 (*Wm. Boott*): VIRGINIA, Harper's Ferry, May 7, 1881 (*John Donnell Smith*): NORTH CAROLINA, Broad River, May, 1841 (*Rugel* according to Kunze, l. c.). The long slender beak of the perigynium and its essentially northern and montane range suggest that further knowledge of the plant may show it to be well distinguished from *C. pennsylvanica*. No other character has yet been found by which it can be recognized, and occasional individuals show transitions in the elongation of the beak.

Var. VESPERTINA, Bailey, Mem. Torr. Cl. i. 74. Rather coarser than the species: the usually very dark staminate spikelet peduncled: perigynia more coarsely hairy, almost hirsute. — The northwestern form, from the Cascade Mts. of BRITISH COLUMBIA to OREGON and VANCOUVER ISLAND.

CAREX UMBELLATA.

Like *C. pilulifera* and *C. pennsylvanica*, *C. umbellata*, Schkuhr, presents considerable variation in the length and breadth of its leaves and in the length of its culms and peduncles. As in those species, likewise, these purely vegetative characteristics in *C. umbellata* seem to accompany no fixed characteristic of the perigynia, nor any special geographic areas; and too often the long-peduncled spikelets of the so-called var. *vicina* may be found on portions of a clump which is otherwise good *C. umbellata*. As in the related species just discussed, however, *C. umbellata* presents at least two geographic tendencies seemingly characterized by constant differences in the perigynia. A third form, of which we as yet know too little, has the perigynia glabrous, thus breaking through one of the distinguishing marks of the *Montanae*.

Carex umbellata is related on the one hand to *C. nigro-marginata*, and on the other to *C. deflexa*. From these two it is usually distinguished without difficulty, but occasional specimens occur which are perplexing. The writer has found that in such cases the best means of distinction between *C. umbellata* and *C. nigro-marginata* is offered by the thickness of the perigynia. In *C. nigro-marginata* the mature perigynia vary from 1.3 to 1.6 mm. in thickness, while in mature *C. umbellata* they are from 1.7 to 2.4 mm. thick. From doubtful forms of *C. deflexa*, *C. umbellata* may best be distinguished by an examination of the scales. In *C. umbellata* the scales are nearly or quite as long as the subtended perigynia, while in *C. deflexa* they are distinctly shorter.

The most marked tendencies of *C. umbellata* are

C. UMBELLATA, Schkuhr, Riedgr. Nachtr. 75, t. Www, fig. 171 (*C. umbellata*, var. *vicina*, Dewey, Am. Jour. Sci. xi. 317 & x. t. D, fig. 13). Low and conspicuously caespitose, forming dense mats: leaves rather stiff, 0.5 to 4.5 dm. long, 1 to 4.5 mm. wide: culms mostly very short and crowded at the base of the leaves, or some elongated, rarely even to 2 dm., and bearing both staminate and pistillate, or staminate spikelets alone: pistillate spikelets 1 to 4, ovoid or oblong, 0.5 to 1 cm. long, sessile or on short or occasionally elongate-capillary peduncles: perigynia plump, stipitate or substipitate, puberulent, 3.2 to 4.7 mm. long; the slender beak nearly or quite as long as the ellipsoid-ovoid to subglobose or pyriform body, and about equalled by the ovate acuminate green or purple-tinged scale: staminate spikelets subsessile or peduncled, 6 to 12 mm. long. — Dry sandy or rocky places, PRINCE EDWARD ISLAND to central MAINE, west to SASKATCHEWAN and BRITISH COLUMBIA, and south to NEW JERSEY, DISTRICT OF COLUMBIA, and INDIAN TERRITORY.

Var. *tonsa*. Similar, but with the perigynia glabrous or merely puberulent on the angles of the long beak. — MAINE, Streaked Mt., Hebron, June 2, 1897 (*J. A. Allen*): CONNECTICUT, rocky wooded slope of Lantern Hill, North Stonington, May 30, 1901 (*C. B. Graves*). A plant with identical glabrous perigynia is figured in Boott, Ill. ii. t. 293, from specimens collected at Methy Portage, ATHABASCA, by *Sir John Richardson*. This and the New England plant represent a tendency unusual in the *Montanae*.

Var. *BREVIROSTRIS*, Boott, Ill. ii. 99, t. 294. Perigynia rather smaller, the broad beak short, about one-third as long as the plump short-hairy body. — The commonest form from SASKATCHEWAN to VANCOUVER ISLAND, south in the mountains to CALIFORNIA and NEW MEXICO: also MAINE, Fort Kent, Ashland, Masardis, Island Falls and Foxcroft (*M. L. Fernald*, nos. 2111, 2112, 2113, 2114, 2115); summit of Sargent Mt., Mount Desert Island (*E. & C. E. Faxon*): NEW HAMPSHIRE, Mt. Willard, and Bald Mt., Franconia (*E. & C. E. Faxon*).

CAREX VAGINATA and *C. SALTUENSIS*.

C. VAGINATA, Tausch, Flora (1821) 557 (*C. vaginata*, var. *alto-caulis*, Dewey, Am. Jour. Sci., Ser. 2, xli. 227. *C. saltuensis*, Bailey, Mem. Torr. Cl. i. 7. *C. altocaulis*, Britton, in Britton & Brown, Ill. Fl. i. 326, fig. 773). The American plant was long considered by Francis Boott

and other caricologists identical with the European; but in 1866 the New York plant was distinguished by Dewey, on account of its tall slender culm, narrow leaves and loose spikelets as var. *alto-caulis*. In 1889, however, Professor Bailey raised the American plant to specific rank as *C. saltuensis*, separating it from the European *C. vaginata* "by its much more slender and less caespitose habit, narrower leaves and less conspicuous sheaths, its alternately-flowered spikes, and its much smaller, less inflated, and conspicuously nerved perigynium." And Dr. Britton, following Professor Bailey's lead in treating the plant as strictly American, has taken up for it Dewey's varietal name as *altocaulis* (not *alto-caulis*).

That American specimens from the deep swamps of western New York, Ontario and Michigan are more slender than some European specimens there can be no doubt; but in northeastern Maine, where the plant is a common species of arbor-vitae swamps, it varies greatly in these characters. Individuals growing in excessive shade are naturally taller and more slender than those in bright light; and the spikelets vary indiscriminately from the slender alternate-flowered tendency supposed to characterize the American plant to the dense-cylindric form said to distinguish the European.

The height of the European plant, too, is often as great as that of the American, while our own plant sometimes fruits when scarcely 2 dm. high (Mt. Albert, Quebec — *Allen*; Blaine, Maine — *Fernald*). A specimen from Christiania collected by Blytt is 5 dm. high, while the extreme height given by Dr. Britton for his *C. altocaulis* is 2 feet (6 dm.).

The breadth of the leaf, likewise, is as variable on one continent as on the other. Both Dewey and Bailey have maintained that the European plant is broader-leaved; yet a specimen from Fries collected in Jemtland (Sweden) has leaves from 1.5 to 1.75 mm. wide, while the broadest leaves seen on the European plant are those of a Lapland specimen (5 mm. wide) from N. J. Andersson. In the American plant the leaves vary from 1.5 mm. wide (Blaine, Maine) to 5 mm. (Montreal).

The variation in the density of the spikelet in the American plant has been already mentioned. In Europe the same variation occurs, specimens from Jemtland (*Ahlberg*), Lapland (*Andersson*) and Finland (*Lehmann*) having the spikelets as loosely flowered as in the most extreme American form.

Nor are the differences assigned by Professor Bailey to the perigynia maintained in mature specimens. Young individuals of the American as well as the European plant have the nerves poorly developed, but in

mature fruit no difference is apparent between plants from Christiania, Norway, and Aroostook Co., Maine.

The sheath, said by Professor Bailey to be "less conspicuous" in the American plant, is 4 cm. long, by 2.7 mm. wide in one of Macrae's Montreal specimens, fully as conspicuous as in the best developed European material. There is, then, no reason why the American *Carex saltuensis*, Bailey (*C. altocaulis*, Britton) with no constant vegetative or morphological character and with a broad range from northern Labrador to the Mackenzie River, northern New England, New York, the Great Lakes and the upper Rocky Mts., should be treated as distinct from *C. vaginata* of Greenland, northern Europe and Asia.

CAREX CAPILLARIS.

C. CAPILLARIS, L. Sp. 977. The Linnaean plant was the low plant of the Scandinavian mountains, described as a span high. This plant, well represented in the Gray Herbarium by European specimens from Andersson, Holmgren, Hoppe, Lehmann, Tuckerman, and others, varies in height from 3 to 25 cm., the spikelets being subapproximate or scarcely remote, the lower at most 2 cm. apart. This dwarf plant occurs likewise in Greenland and northeastern Asia. It has been examined from the following regions in America — LABRADOR, Dead Islands (*J. A. Allen*): NEWFOUNDLAND, without locality (*La Pylaie*); Middle Arm, Bay of Islands (*A. C. Waghorne*): QUEBEC, dry stony ground, near summit — 1,150 m. — Mt. Albert (*J. A. Allen*): MAINE, Mt. Kineo (*T. C. Porter et al*): NEW HAMPSHIRE, Mt. Washington (*Wm. Oakes et al*): COLORADO, Rocky Mts., alt. 3,385 m. (*E. L. Greene* in *Exsicc. Olney*); South Park (*J. Wolfe*, no. 1059); Clear Creek, Georgetown, alt. 2,615 m. (*H. N. Patterson*, no. 144, in part): UTAH (*S. Watson*, no. 1261): WYOMING, La Plata Mines (*E. Nelson*, no. 5260).

Var. *ELONGATA*, Olney, in herb. & in Rothr. Prelim. Rep. Wheeler Pl. 53 (as *nomen nudum*). Tall, 2 to 6 dm. high, forming loose stools: pistillate spikelets remote, often 6 or 8 cm. apart. — Mossy woods and sphagnum-swamps. RUPERT LAND, Lake Mistassini (*J. M. Macoun*): NEWFOUNDLAND, Coal River, Bay of Islands (*A. C. Waghorne*, no. 24): QUEBEC, Ste. Anne des Monts and Little Metis (*J. A. Allen*): NEW BRUNSWICK, Drury's Cove, St. John (*Wm. Boott*): MAINE, Fort Fairfield (nos. 140, 2029), Blaine (no. 2028), Mars Hill — *M. L. Fernald*: NEW YORK, Otter Creek, near Cortland (*S. N. Cowles*):

ONTARIO, Bruce Co. (*J. Macoun*): MICHIGAN, Point de Tour (*Wm. Boott*); Port Huron (*C. K. Dodge*): SASKATCHEWAN (*Bourgeau*): ASSINIBOIA, Assiniboine River (*J. Macoun*): ALBERTA, Bow River (*J. Macoun*): COLORADO, Rocky Mts., alt. 2460 m. (*E. L. Greene* in *Exsicc. Olney*); Twin Lakes (*J. Wolfe*, no. 1060 [type]); Clear Creek (*Parry*, no. 386, *Patterson*, no. 144, in part): UTAH, Aquarius Plateau (*L. F. Ward*, no. 484): IDAHO, Lake Pend d'Oreille (*Sandberg, MacDougal & Heller*, no. 751). A plant confined in the East to arbovitae swamps at low altitudes, and in its tall lax habit and very distant spikelets hardly suggesting the dwarf alpine *C. capillaris* with approximate spikelets. Somewhat similar specimens in the Gray Herbarium from Salzburg, Austria, suggest that the same form may be present in Europe.

INDEX TO SPECIES.

Carex

- adusta, 451, 452, 464, 476, 478, 479, 480, 481.
 " var. argyrantha, 478.
 " " glomerata, 481.
 " " minor, 471.
 " " sparsiflora, 480.
 aenea, 461, 462, 464, 480.
 alascana, 482.
 alata, 448, 450, 451, 463, 476.
 " var. ferruginea, 463, 477.
 albolutescens, 448, 450, 451, 452, 464, 472.
 " var. argyrantha, 478.
 " " cumulata, 472.
 " " glomerata, 481.
 " " sparsiflora, 452, 453, 480.
 altocaulis, 507, 508, 509.
 approximata, 494.
 aquatilis, 495, 496, 497.
 " X stricta, 496.
 " var. cuspidata, 497.
 " " elatior, 496.
 " " epigejos, 497.
 " " sphagnophila, 497.
 " " virescens, 497.
 arcta, 458, 459, 466, 486.
 argyrantha, 452, 478.
 arida, 467.

Carex

- atlantica, 454, 456, 457, 458, 485.
 Bastardiana, 503.
 Bebbii, 449, 462, 478.
 Bicknellii, 450, 451, 463, 475.
 Bolanderi, 490, 491.
 " var. sparsiflora, 491.
 brizoides, 487.
 bromoides, 465, 490.
 brunnescens, 453, 458, 459, 460, 466, 489.
 " var. gracillior, 489.
 Buckleyi, 489.
 canescens, 453, 458, 459, 460, 466, 486, 487, 488, 491.
 " B, 489.
 " var. alpicola, 459, 489.
 " " brunnescens, 489.
 " " disjuncta, 466, 488.
 " " dubia, 459, 487.
 " " oregana, 458, 486.
 " " polystachya, 458, 486.
 " " robustina, 459, 487.
 " " sphaerostachya, 489.
 " " subulolicea, 459, 466, 488.
 " " vitilis, 489.
 " " vulgaris, 458, 459, 486, 489.
 capillaris, 509, 510.

Carex

- capillaris, var. elongata, 509.
Carltonia, 495.
cinerea, 487.
communis, 497, 498, 499, 500, 501, 502,
503, 504, 505.
" var. Wheeleri, 502, 503,
504.
Crawfordii, 461, 469.
" var. vigens, 462, 470.
cristata, 450, 462, 469, 472, 473.
" var. mirabilis, 473.
cristatella, 472.
curta, 453, 487.
" var. brunnescens, 489.
cyperoides, 481.
deflexa, 506.
Deweyana, 465, 490.
" var. sparsiflora, 491.
dioica, 482.
echinata, 447, 453, 454, 455, 456, 458,
465, 483, 485, 492.
" var. angustata, 465, 484.
" " cephalantha, 455, 456,
465, 484.
" " conferta, 485.
" " excelsior, 465, 484.
" " microstachys, 454, 455.
" " ormantha, 465, 483.
elachycarpa, 467, 492.
elongata, 453, 487.
Emmonsii, 498.
exilis, 453, 460, 465, 482, 495.
" var. androgyna, 482.
" squamacea, 482.
festiva, 474.
festucacea, 450, 451, 464, 475, 477.
" var. brevior, 464, 474, 477.
" " mirabilis, 473.
" " tenera, 474.
filiformis, 503.
foenea, 449, 451, 452, 462, 464, 472, 478.
" var. B, 450, 451, 477.
" " γ, 476.
" (?) ferruginea, 451, 477.
" " perplexa, 452, 464, 478,
480.
" " sparsiflora, 480.
" (?) subulonium, 476.
furva, 494.
Gebhardtii, 453, 459, 489.
glareosa, 466, 493.

Carex

- gynocrates, 453, 460, 465, 482, 495.
 " var. monosperma, 482.
 heleonastes, 459, 467, 494.
 helvola, 492.
 interior, 454, 457, 458, 465, 485, 493.
 " var. capillacea, 465, 485.
 Kunzei, 486.
 Lachenalii, 494.
 laeviculmis, 491.
 lagopina, 466, 487, 494.
 lagopodioides, 468, 469.
 " var. cristata, 472.
 " " mirabilis, 478.
 " " moniliformis, 469.
 " " scoparia, 468.
 lapponica, 488.
 Leersii, 483.
 leporina, 449, 462, 464, 468, 479, 494, 495.
 " var. bracteata, 472.
 Liddoni, 469, 471.
 lucorum, 505.
 marina, 495.
 mirabilis, 450, 462, 463, 472, 473.
 " var. perlonga, 462, 473.
 " " tincta, 462, 473.
 monosperma, 482.
 muricata, 483.
 muskumensis, 461, 463, 467.
 nigro-marginata, 506.
 norvegica, 466, 485, 492, 493.
 onrensis, 462, 471.
 ovalis, 479.
 pallida, 469.
 parviflora, 494.
 pedicellata, 499, 503, 504.
 " var. Wheeleri, 503, 504.
 pennsylvanica, 500, 504, 505, 506.
 " var. lucorum, 505.
 " " vespertina, 506.
 Persoonii, 489.
 pilulifera, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506.
 " var. Leersii, 498, 499, 503, 504.
 " " longibracteata, 498, 499, 500, 502, 503, 504.
 " " pallida, 498, 500.
 pinguis, 481.
 pratensis, 471.
 " var. furva, 452.

Carex

- pratensis*, 452, 461, 462, 464, 471.
Redowskiana, 482.
remota, 490.
Richardi, 487.
saltuensis, 507, 508, 509.
saxumbra, 504.
scirpina, 458, 485.
scirpoides, 457, 458, 485.
scirpoides, 453, 454, 455, 457, 458, 485.
scoparia, 447, 448, 449, 460, 461, 463, 467.
 " *var. condensata*, 461, 468.
 " *" lagopodioides*, 468.
 " *" minor*, 447, 448, 449, 470.
 " *" moniliformis*, 449, 461, 468, 469.
 " *" muskingumensis*, 467.
seorsa, 458, 460, 465, 486, 491.
siccata, 461, 469.
silicea, 463, 464, 476.
sparsiflora, 453, 480.
sphaerostachya, 489.
stellulata, 454, 455, 456, 483.
 " *γ*, 485.
 " *var. angustata*, 455, 484.
 " *" conferta*, 485.
 " *" scirpina*, 457, 485.
 " *" scirpoides*, 457, 485.
 " *" sterilis*, 485.
sterilis, 453, 454, 455, 456, 457, 458, 465, 483, 484.
 " *β*, 484.
 " *var. aequidistans*, 484.
 " *" angustata*, 484.
 " *" cephalantha*, 484.
 " *" excelsior*, 455, 458, 484.
straminea, 447, 448, 450, 451, 462, 463, 474, 477.
 " *var. alata*, 476.
 " *" aperta*, 451, 475.
 " *" brevior*, 450, 451, 476, 477.
 " *" chlorostachys*, 472.
 " *" Crawei*, 450, 451, 475.
 " *" cristata*, 472.
 " *" cumulata*, 472.

Carex

- straminea*, *var. echinodes*, 463, 474.
 " *" ferruginea*, 451, 477.
 " *" festucacea*, 477.
 " *" foenea*, 472.
 " *" intermedia*, 472.
 " *" invisata*, 475.
 " *" Meadei*, 475.
 " *" minor*, 474.
 " *" mirabilis*, 473.
 " *" moniliformis*, 476.
 " *" Schkuhrii*, 477.
 " *" silicea*, 476.
 " *" tenera*, 474, 475.
 " *" typica*, 477.
syncephala, 464, 481.
tenera, 448, 450, 451, 463, 474, 475.
 " *var. invisata*, 463, 474, 475.
 " *" major*, 475.
 " *" Richii*, 463, 464, 474, 475, 476.
 " *" suberecta*, 477.
tenuiflora, 466, 486, 491.
tribuloides, 449, 450, 461, 468.
 " *var. Bebbii*, 478.
 " *" cristata*, 472, 478.
 " *" moniliformis*, 449, 468, 469.
 " *" reducta*, 449, 461, 468, 469, 474.
 " *" turbata*, 461, 469.
trisperma, 466, 492.
Tuckermanni, 449.
umbellata, 506, 507.
 " *var. brevirostris*, 507.
 " *" tonsa*, 507.
 " *" vicina*, 506, 507.
vaginata, 507, 508, 509.
 " *var. alto-caulis*, 507, 508.
varia, 498, 499, 500, 503, 504.
 " *var. minor*, 499, 503, 504.
 " *" pedicellata*, 504.
vitis, 458, 459, 489.
xerantica, 462, 464, 479.

Vigna

- Gebhardi*, 489.
stellulata, 483.

EXPLANATION OF PLATES.¹

PLATE I.

- Carex muskingumensis*: Fig. 1, spike; Fig. 2, perigynium.
C. scoparia: Fig. 3, spike; Fig. 4, perigynium.
C. scoparia, var. *condensa*: Fig. 5, spike.
C. tribuloides: Fig. 6, spike; Fig. 7, perigynium.
C. tribuloides, var. *reducta*: Fig. 8, spike.
C. siccata: Figs. 9, 10, spikes; Fig. 11, perigynium.
C. Crawfordii: Fig. 12, spike; Fig. 13, perigynium.
C. Crawfordii, var. *vigens*: Fig. 14, spike.
C. oronensis: Fig. 15, spike; Fig. 16, perigynium.
C. praticola: Fig. 17, spike; Fig. 18, perigynium.
C. cristata: Fig. 19, spike; Figs. 20, 21, perigynia.
C. albolutescens: Figs. 22, 23, spikes; Fig. 24, perigynium.

PLATE II.

- C. mirabilis*: Fig. 25, spike; Fig. 26, perigynium.
C. mirabilis, var. *perlonga*: Fig. 27, spike.
C. straminea: Fig. 28, spike; Fig. 29, perigynium.
C. straminea, var. *echinodes*: Fig. 30, spike.
C. tenera: Fig. 31, spike; Fig. 32, perigynium.
C. tenera, var. *Richii*: Fig. 33, terminal spikelet; Fig. 34, perigynium.
C. tenera, var. *invisa*: Figs. 35, 36, spikes.
C. Bicknellii: Figs. 37, 38, spikes; Figs. 39, 40, perigynia.
C. silicea: Fig. 41, spike; Fig. 42, perigynium.
C. alata: Fig. 43, spike; Fig. 44, perigynium.
C. alata, var. *ferruginea*: Fig. 45, spike; Fig. 46, perigynium.

PLATE III.

- C. festucacea*: Fig. 47, spike; Fig. 48, perigynium.
C. festucacea, var. *brevior*: Figs. 49, 50, spikes; Fig. 51, perigynium.
C. Bebbii: Fig. 52, spike; Fig. 53, perigynium.
C. foenea: Fig. 54, spike; Fig. 55, perigynium.
C. foenea, var. *perplexa*: Fig. 56, spike; Fig. 57, perigynium.

¹ The plates illustrating this synopsis were prepared by Mr. F. Schuyler Mathews from characteristic specimens. The figures of the spikes represent life-sized individuals, while those showing the inner faces of the perigynia are four times as large as in nature.

- C. leporina* : Figs 58, 59, spikes ; Fig. 60, perigynium.
C. xerantica : Fig. 61, spike ; Fig. 62, perigynium.
C. aenea : Figs. 63, 64, spikes ; Figs. 65, 66, perigynia.
C. adusta : Fig. 67, spike ; Figs. 68, 69, perigynia.
C. synchocephala : Fig. 70, spike ; Fig. 71, perigynium.

PLATE IV.

- C. gynocrates* : Figs. 72, 73, 74, 75, spikes ; Figs. 76, 77, perigynia.
C. exilis : Figs. 78, 79, 80, 81, 82, spikes ; Fig. 83, perigynium.
C. echinata : Figs. 84, 85, 86, 87, spikes ; Fig. 88, perigynium.
C. echinata, var. *ormantha* : Fig. 89, spike.
C. echinata, var. *excelsior* : Figs. 90, 91, spikes.
C. echinata, var. *cephalantha* : Figs. 92, 93, spikes ; Fig. 94, perigynium.
C. echinata, var. *angustata* : Figs. 95, 96, spikes ; Fig. 97, perigynium.
C. sterilis : Figs. 98, 99, spikes ; Fig. 100, perigynium.
C. interior : Figs. 101, 102, 103, spikes ; Figs. 104, 105, perigynia.
C. seorsa : Figs. 106, 107, spikes ; Figs. 108, 109, perigynia.

PLATE V.

- C. arcta*. Figs. 110, 111, 112, spikes ; Fig. 113, perigynium.
C. canescens : Fig. 114, spike ; Fig. 115, perigynium.
C. canescens, var. *sublobiacea* : Fig. 116, spike ; Fig. 117, perigynium.
C. canescens, var. *disjuncta* : Figs. 118, 119, spikes ; Fig. 120, perigynium.
C. brunnescens : Figs. 121, 122, spikes ; Fig. 123, 124, perigynia.
C. bromoides : Fig. 125, spike ; Fig. 126, perigynium.
C. Deweyana : Fig. 127, spike ; Fig. 128, perigynium.
C. tenuiflora : Fig. 129, spike ; Fig. 130, perigynium.
C. trisperma : Fig. 131, spike ; Fig. 132, perigynium.
C. elachycarpa : Fig. 133, spike ; Fig. 134, perigynium.
C. norvegica : Fig. 135, spike ; Fig. 136, perigynium.
C. glareosa : Fig. 137, spike ; Fig. 138, perigynium.
C. lagopina : Fig. 139, spike ; Fig. 140, perigynium.
C. heleonastes : Fig. 141, spike ; Fig. 142, perigynium.















